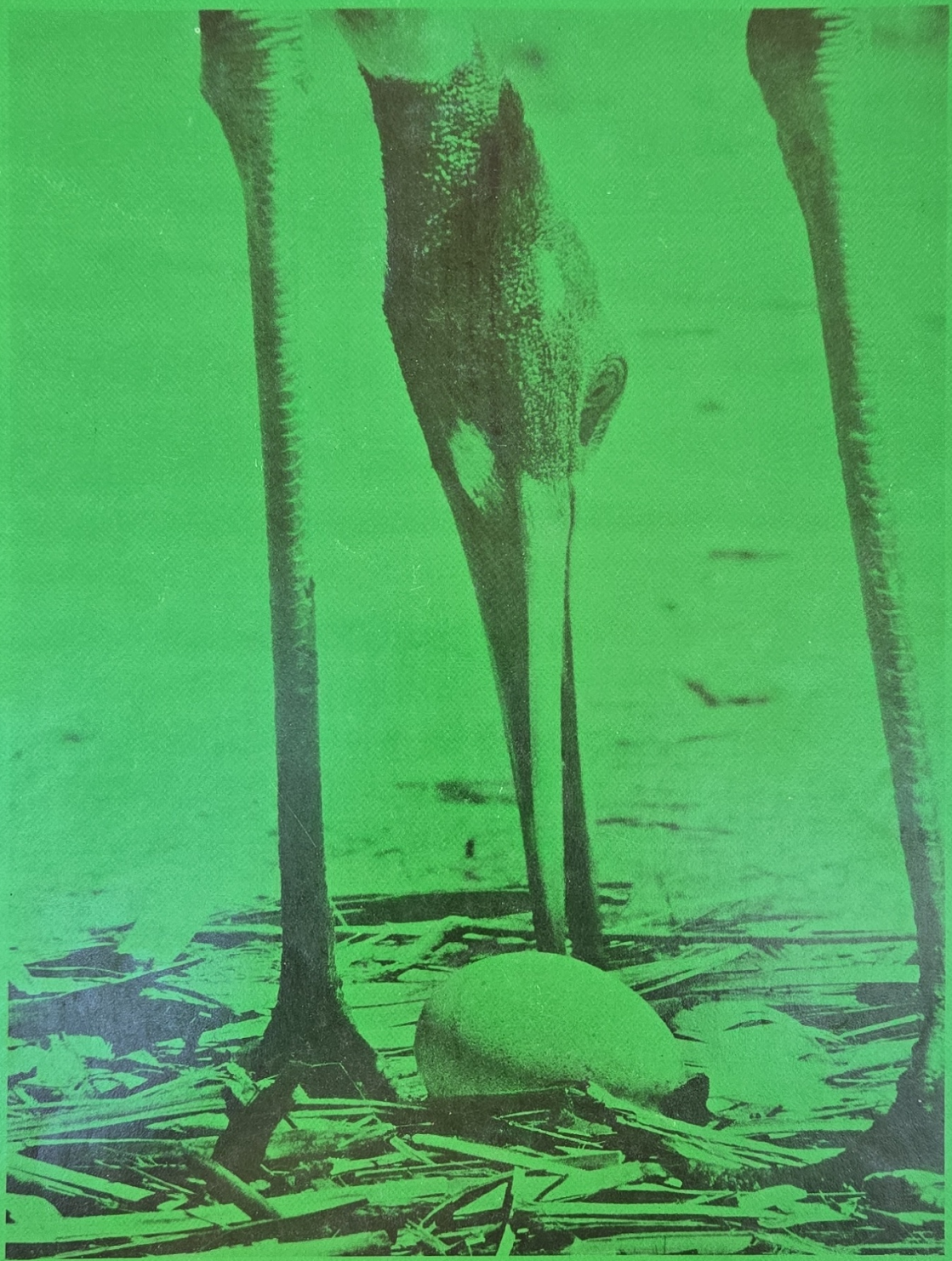
REGIONAL OFFICE FOR ASIA AND THE FAR EAST

TIGERPAPER



VOL V NO 1 JANUARY 1978

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

UNITED NATIONS ENVIRONMENT PROGRAMME

TIGERPAPER is a quarterly news bulletin dedicated to the exchange of information relating to wildlife and national parks management for the Asia-Pacific region. TIGERPAPER is compiled, edited, and distributed by Jaap H. Kuper, Acting Regional Wildlife and National Parks Management Officer, under the FAO Regional Priority Programme for Asia and the Far East, with assistance for this issue by Janice Naewboonnien. Financial assistance is provided by UNEP.

TIGERPAPER
FAO Regional Office for Asia and the Far East
Maliwan Mansion, Phra Atit Road
Bangkok 2, Thailand

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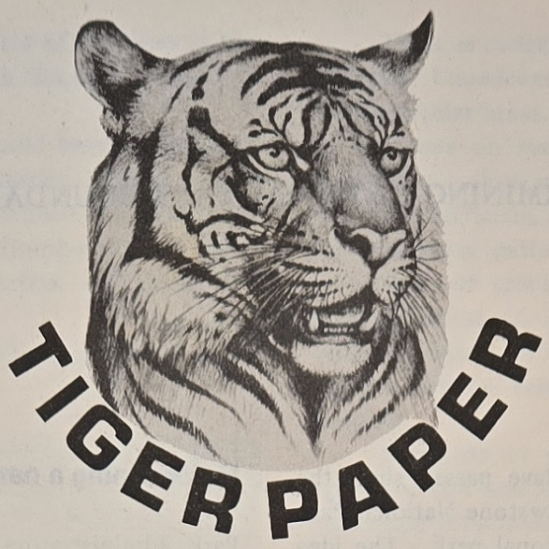


EDITORIAL

Most people in the Asia-Pacific Region use wood as their source of energy for cooking and heating. Wood is also used as industrial fuel. A critical problem faced by the countries of the Region is therefore the continued supply of firewood and charcoal. Shortage of woodfuel leads to increased pressure on the remaining forest and thus on the wildlife habitats.

It will amount to lack of sense of proportion if we only emphasized the wildlife aspects of fuelwood shortage. The shortage has direct impact on the welfare of the people. Most people do not have any other choice than using woodfuel and they have to spend a growing part of their income on this commodity. Furthermore, firewood shortage leads to over-exploitation of forest resources and to soil erosion. The effects are well known. The soil loses its storage capacity and both floods and water shortage follow. This in turn hampers the much needed growth of agricultural production.

The extent of the problem varies between countries. Some have abundant forest resources and produce large amounts of timber and woodfuel, but even here, fuelwood may be locally scarce and transport expensive. Some others have only limited forest resources and use most of the wood as fuel. In situations of fuelwood scarcity, dung of domestic animals is often used as fuel rather than as fertilizer. In India, for example, lack of fuelwood has forced many rural householder to use cattle dung as an alternative fuel, resulting in consumption equivalent to over 6 million tons of nitrogenous fertilizer – a figure slightly more than current total annual fertilizer consumption.

The main reason for the enourmous firewood demand is the ever increasing population. Although curbing the population growth is of high priority to many of the governments in the region, only very limited success has been achieved. Most populations are still growing very fast.

The consequences of fuelwood shortage are thus far reaching: destruction of whole ecosystems, degradation of arable land, additional hardhsip for the poor and extermination of wildlife. It is heartening to see that the problem is now receiving some attention. Hopefully it is not too late to save some of the natural forests and their wildlife. Fuelwood plantations and other kinds of forestry for local community development could play an important role here.

Solving the fuelwood problem requires advance planning and PLANTING. Trees must be planted NOW!

WILDLIFE AND NATIONAL PARKS MANAGEMENT BIBLIOGRAPHY

FAO has published the first edition of a bibliography on wildlife and national parks management with regard to the Asia-Pacific region. TIGERPAPER readers who are interested to receive a copy are invited to write to the editor of TIGERPAPER, FAO Regional Office, Phra Atit Road, Bangkok 2, Thailand.

DETERMINING NATIONAL PARK BOUNDARIES

by Bernardo Zentilli

More than a hundred years have passed since the United States established Yellowstone National Park in 1872, the world's first national park. The idea of preserving natural areas as national parks has since spread to most of the world's countries.

National parks have been established in various ways, but currently the tendency is to accept their creation only through special laws that will guarantee their protection in perpetuity.

Although differences exist from one country to another in both the method and the reasons for the establishment of national parks, most countries have adopted the definition put forth by the International Union for Conservation of Nature and Natural Resources (IUCN) at its 1969 meeting in New Delhi. The New Delhi language is as follows:

A national park is a relatively large area: (1) where one or several ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest or which contains a natural landscape of great beauty; and (2) where the highest competent authority of the country has taken steps to prevent or eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment; and (3) where visitors are allowed to enter, under special conditions, for inspirational, educative, cultural and recreative purposes.

Notwithstanding the above definition, each individual national park will of course have its own special characteristics which will require a close study by those persons responsible for planning, administration and management in order to enforce rules that will ensure fulfillment of the purposes for which the park was established and to preserve the values it contains.

One of the most important and most difficult initial actions will be the definition of the area to be included within the park.

Determining a national park's boundaries

Park administrators normally face the problem of boundary definition from one of two different conditions: (a) an undefined area considered to have the outstanding attributes to justify its establishment as a national park, and a recommendation must be made as to the best boundaries for the area; or (b) a revision of the boundaries of an existing national park is necessary. The methodology followed in both situations is similar, starting from the statement of objectives. This statement will be the basis for the first general conclusions as to park size, taking into account natural and cultural resources to be protected, access and visitation, and other purposes. Without a carefully considered statement of objectives, reflecting identification and inventory of biological, physical, and cultural resources, it is most unlikely that adequate park boundaries could be determined. Let us look at the statement of objectives for Chile's Rapa Nui National Park, for example. The management plan for this park, which is located on Easter Island, set forth six broad objectives to guide the work of planning development and operation. They are as follows:

1. To protect and enhance its archeological values, along with physiognomical features in their vicinity;

2. To protect and develop its natural, land and marine values;

3. To encourage and facilitate research into cultural and natural aspects and those related to managing and interpreting the park's resources;

4. To contribute to enlightening the public about the park's historical, cultural and natural features, within the environment of the park itself;

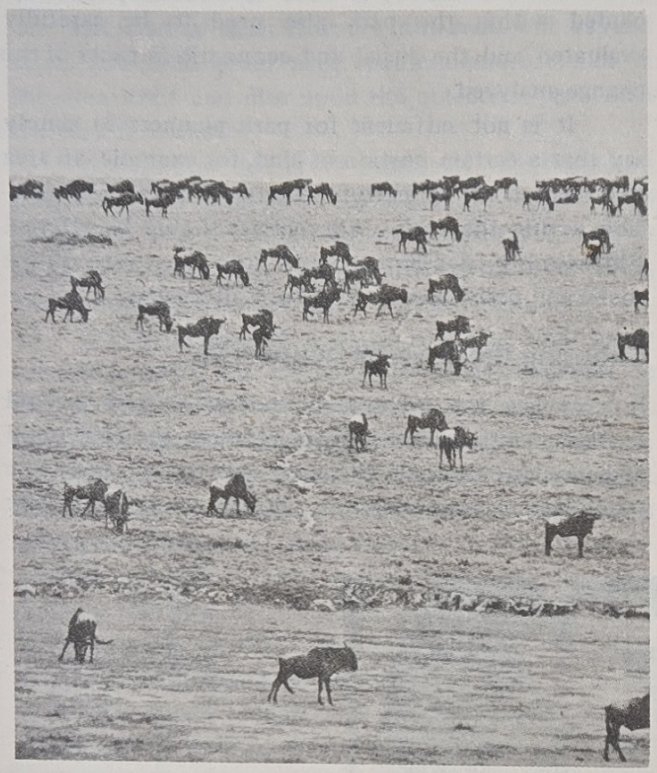
5. To develop and broaden recreational opportunities in relation to historical interpretation, the land environment and the sea environment, and tourism as well—but all in keeping with the other objectives;

6. To further the island's and the country's

economic development by means of activities in the field of tourism in keeping with the other objectives of the park.

All of these objectives would have a bearing on the boundaries eventually chosen. Clearly, the archeological resources must be included. So must their natural setting and the adjoining sea. So must all areas needed for interpretation and access by visitors.

These objectives, then, serve as an overall guide for fixing boundaries.



Animals and their needs must be considered carefully when park boundaries are determined. For exemple, where herd animals migrate to follow the grass, their seasonal routes should be considered for inclusion within the protected area. (Photo Gilbert).

Basic principles

Certain basic principles can be set out as guideposts for the work:

1. *The boundaries should encompass the values or resources that justify establishment of the park.*

This principle emphasizes the necessity of having a thorough resource inventory and analysis prior to the preparation of the management plan and establishment of park boundaries.

2. *All natural areas that exert a major influence upon protection of the park's resources should be considered for inclusion within the boundaries.*

There is considerable variation in the amount of scientific knowledge available for specific countries and particular areas. This, of course, will have a degree of influence on making the best decisions regarding boundaries. For example, in many countries there will be insufficient research to have established wildlife migration patterns, habitat requirement or even inventories of species that would assist the planner. In these instances, it is sometimes necessary to make decisions based on the best information available and initiate needed research and studies as quickly as possible.

Scientists are presently attempting to decide the optimum size and shape of natural reserves based on ecological principles. Although the park planners will usually be faced with many factors other than those which are strictly "ideal" for genetic and species protection, there are interesting theories regarding this important aspect, and park planners should be aware of them.

3. *The boundaries should encompass buffer zones to preclude future use of areas which could pose a threat to the park's integrity.*

Careful thought and analysis must be given to what future use of land surrounding a park could or will be made. At times this information may be available through regional planning offices or development plans from other agencies. In other instances, where large portions of presently undisturbed lands are involved, it may be desirable to recommend an alternative use that would be most compatible with the park. For example, a properly managed forest reserve surrounding a national park may serve as a buffer area, while agricultural development might not be compatible.

This points out the need, whenever possible, to establish the park boundary within the context of a larger regional plan. Establishing the National Park can provide a stimulus to other agencies and organizations whose planning will ultimately affect the park, to reach agreement on compatible land use outside the park boundaries.

4. *The boundaries should enclose sufficient area to facilitate infrastructure for administration, visitor use facilities, protection, maintenance, and circulation, even though these areas may in themselves be devoid of interest from the standpoint of conservation.*

If significant development is anticipated within the park boundaries consideration must be given to allowing sufficient space isolated from critical natural or cultural areas to accommodate this planned infrastructure.

The environmental impact of proposed development within the park must be analyzed from the standpoint of what additional land is necessary for

initiating development impact.

5. *The boundaries should include any areas which are of themselves the setting for the park's most noteworthy features and which, if left out, might undergo changes or development which would spoil the park's aesthetic values.*

These considerations will include a number of factors such as views to and from the park, potential water pollution from upstream areas, air pollution, noise, and other degrading influences against which there must be protection.

Special problems

In actual practice, efforts to include all the needed land will encounter problems of various kinds. Such problems may stem from such factors as the presence of development projects that already have been built or are being planned for surrounding land, the impossibility of acquiring certain tracts of land, the existence of conflicting land boundaries, and so on. If so, establishing the park's boundaries may entail foregoing, at least in part, some of the basic principles we have outlined. The technical staff in charge of the work must try to achieve the best balance possible between the needs of the areas for which improvement is sought and the outside pressures that tend to reduce the amount of available land.

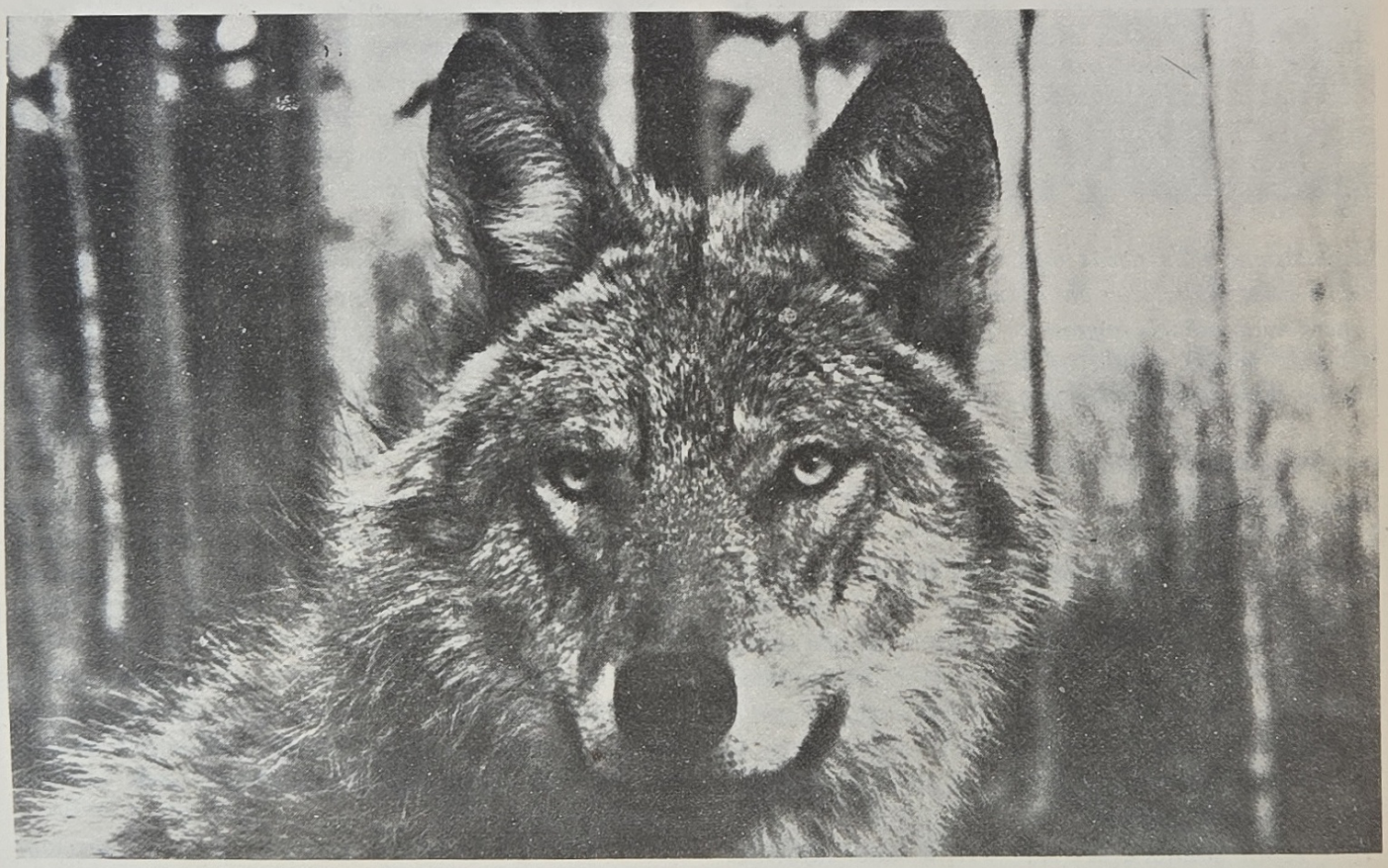
It is important that the areas included within the park boundary be justified within the plan, and the reasons for inclusion clearly pointed out. This may also necessitate describing what alternative uses of the land proposed for inclusion within the park boundaries might be; for example, forestry production, grazing or agricultural use might also be possible land uses for which there may be pressure and the planner must carefully point out why protection is the highest and best use.

The present use and capacity of areas to be included within the park also need to be carefully evaluated and the social and economic impacts of this change analyzed.

It is not sufficient for park planners to simply say that a certain portion of land, for example, an area that is used for agriculture, should be taken for inclusion within the park. Alternatives should be offered. Furthermore, decision makers must be aware of the social and political impact of such alternatives.

Choosing the physical boundaries

In choosing the physical boundaries certain general recommendations are fitting, although the likelihood of being able to apply them will vary in each case. The following recommendations are given as examples:



Wolf (Stern).

The use of important readily identifiable geographic features such as rivers, mountain peaks and ridges.

The use of highways, roads or other works such as canals, oil pipelines, railway lines, etc., as well as state, provincial or national boundaries, and other similar features.

The use of coastlines, estuaries, islands, etc.

These features contribute to making the boundaries permanent, easy to identify, and not dependent upon any special devices for their demarcation such as fences, markers or other burdensome installations. The selection of such features, however, will depend upon how well other park requirements are met in the area itself and also upon the objectives for which the park is intended.

A river may not prove satisfactory for boundary purposes if its basin is of material importance to the park itself or if the outer watershed is subject to development in ways that could be incompatible, or affect the course of the river, or alter the landscape.

Likewise, use of a canal or road may prove unsatisfactory if the area contains fauna that must be free to migrate or move on to areas beyond the park. In certain cases boundaries of this kind constitute ecological barriers that exercise a negative effect upon the park itself. Similar disruptions can occur if in setting up boundaries along beaches or coastlines the existing ecological relationship between the land portion and the water portion—a relationship that may be quite essential for the ecosystem's preservation—is not taken into account.

The survey maps that will be required, and which will be helpful for future technical managerial operations or in connection with any legal actions, have to be prepared after boundaries have been set up, or perhaps simultaneously. In many countries the laws require written verbal descriptions of the boundaries to be established. In that event special care must be taken to give accurately the names of topographic features and to select the most prominent ones so as to avoid any possible errors or ambiguities that may lead to lawsuits.

In graphic representations of boundaries the survey maps used in any earlier studies should be employed as basic material. Existing laws may require that new topographic maps be drawn up. Often there is a tendency to make an extremely precise topographical survey covering an entire area that has been declared a national park. However, this undertaking, which is quite an expensive one, is not required at the outset in every instance, and in most cases a traverse showing the boundaries is sufficient.

Detailed maps showing the areas within the park can be drawn up later on, in keeping with whatever need may actually arise.

Procedure for setting up boundaries

At the time when studies for establishing a park are first undertaken or whenever a plan for managing an already existing one is formulated, the question of the park's boundaries arises.

We already have pointed out certain general criteria that are applicable in establishing a national park's boundaries. The following steps are the most important ones in establishing boundaries in the sequence in which they appear:

1. The gathering of background material on the land in question, including the collection of prior studies of its geology, climate, flora, fauna, cultural features, etc., and the gathering of basic map materials.

2. A study of the particular purposes for which the park is intended, taking into account its features and resources.

3. An analysis of the proposed general area in relation to the areas that surround it. During this stage it will be profitable to look into any development programs for the area that are currently being studied or are already being implemented, and also to give thought to the basic work engaged in by the area's inhabitants and to opinions about the park which they may have expressed either directly or through organizations to which they belong.

4. The analysis of apparent overall boundaries the park may have, in line with management objectives.

5. Establishing in detail the park's boundaries, both on-site and in maps. Any written descriptions of the boundaries that may be required must be prepared.

6. Reproduction of the national park's boundary maps.

Each country has its own laws regarding private land ownership, and as to ownership of property by its states or by the nation itself. Inasmuch as a national park's boundaries will be valid only if they have been established in accordance with existing laws, it is advisable to include a legal advisor on the team to which the work of analyzing and establishing the boundaries is entrusted.

Lastly, let us emphasize that the ultimate aim in setting boundaries is to have a national park that will fulfil completely the purposes of the park as intended, for the full benefit of the nation and its people.

Bernardo Zentilli is Environment Programme Officer at FAO in Rome. Earlier he was head of FAO's Project on Wild Land Management for Latin America, and before that Chief of the Office of Environmental Preservation in the Chilean Agency for National Forests, with responsibility for national parks and wildlife.

from **PARKS** Vol 1 no.4, *March 1977.*

VELAVADAR NATIONAL PARK, GUJARAT, INDIA

by K.S. Dharmakumarsinhji

Velavadar National Park was elevated from sanctuary status to National Park in 1976 under the Wildlife (Protection) Act of 1972. The Velavadar National Park is located forty miles north of Bhavnagar town. The Sanctuary was formerly a small portion of what is known as the Bhal, which means a saline flat tract of land formed by the natural reclamation of riverine silt from the rivers Sabarmati, Mahi and Narmada of the Gujarat hinterland, and partly by silt of the Bhogavos and Sukhbhader and small streams debouching into the gulf of Cambay from the highlands of the Kathiawar peninsula. The Bhavnagar district lies at the head of the western side of the gulf of Cambay in the Kathiawar peninsula at 21° 46' north and 72° 14' east.

The Bhal alluvium composes one of the richest grasslands found in the State. The Bhal, formerly an extensive wasteland and under the sea in tertiary and post-tertiary period, is now a cultivated tract comprising mostly wheat and cotton crops. Thus this area of approximately 1000 or more sq. miles embodies cropland, grassland, marshland and saline wasteland. The Imperial Gazeteer (Kathiawar) describes it thus: "In the Bhal land along the northeast, during the rainy season (June-October), the country is under water and between the low island village sites communication is cut off except by boat. In the cold weather (November-February) the Bhal is covered with miles of unbroken wheat fields. The harvest (February–March) is a time of life and activity. But when the crop is housed, this black level tract, open to a burning sun and swept by hot winds and clouds of salt dust, is a region to be shunned almost as carefully as the neighbouring Rann".

The sanctuary as demarcated in 1972 covered 2200 acres comprising the best savannah of the relict Bhal grasslands. This area was formerly much larger in extent in the erstwhile State of Bhavnagar and included the adjoining area of Mithapur, the private grazing land of the Maharajahs of Bhavnagar. The Velavadar-Mithapur grassland was declared a Blackbuck Sanctuary in order to protect the thriving herd of Blackbuck *(Antilope cervicapra).* Cement posts were erected to demarcate the area which was formed before Independence, during which time strict protection was enforced and very little hunting, mainly by trained cheetahs, was permitted. The author recollects seeing thousands of antelopes in the preserve with a total population of about 15,000 head in the Bhavnagar Bhal. The Bhal limits extended northwest to Limbdi and northwards to Dholka-Dhandhuka with the apex at the gulf of Cambay, and south to the river Kalubhar opposite Bhavnagar City. Thus the range of Blackbuck stretched far and wide and isolated herds were to be seen in grass patches and where open land lay untilled. The congregation of the big herds was largely seen at Velavadar-Mithapur and surrounding areas.

The protection of the Indian antelope was assured by the swampy nature of the terrain caused periodically by the tides and monsoon rains which made most of the Bhal inaccessible as is the case in

the Ranns of Kutch. The unbridged Kalubhar served as a barrier to poachers from Bhavnagar City. Similarly rivulets with muddy bottoms were traps for motorists and the wet pot holes in flat country were equally treacherous, thus the natural protection over and above the strict protection afforded by the Bhavnagar Durbar enabled the Blackbuck population to grow to enormous size. Even then, stray cases of poaching were recorded as the density of antelope was a great temptation to hunters.

After independence, the popular government of Saurashtra, in order to mitigate severe drought and famine conditions allowed wildlife to be killed on sight for the protection of crops and this slaughter continued unabated in the Bhal area. With the building of roads for bus services, the sanctuary became a veritable hunting ground for poachers some of whom came from as far as Ahmedabad, Jaipur and Bombay.

When the situation for the antelope became very grave, the author and his nephew Shivbhadrasinhji proposed that the Velavadar grassland (also a former breeding ground of the vanishing Great Indian bustard) be declared a sanctuary. For nearly fifteen years from 1948 they fought a losing battle, since much of the Bhal was within the popular vote of the opposition party.

Even after the formation of the Velavadar sanctuary, protection of the animals still was owed largely to the natural barriers. A small police force shot Blackbuck at the one and only water hole in the sanctuary and poachers in jeeps made use of roads and the flat land, so conducive to stampedes, and ran down the animals. The Forest Guards' main occupation was storing grass. They had no firearms and were protected by the police staff. They had no quarters to live in and were at the mercy of the Village police and headman. Finally when most of the herds in Gujarat had been decimated and destroyed the State sanctioned a jeep for the sanctuary, without any equipment. However, the surrounding people have been so cooperative in preserving the antelope that poaching was kept at a minimum.

The rains failed in 1975 and drought swept over the Bhal. For the first time in the history of the Velavadar Blackbuck, artificial feeding was undertaken by the Forest department through its Wildlife wing. This saved a major portion of the Blackbuck from perishing. The author's estimate of the Velavadar-Mithapur Blackbuck population then was well over two thousand and in the Bhal nearing three thousand.

In early June 1976, a cyclone coupled with incessant rain and wind passed over the district causing the Bhal to be flooded. A large number of the Velavadar-Mithapur population died leaving only those that could reach higher ground and shelter. 923 dead were recorded but many more Blackbuck must have succumbed.

In early May 1977 a census of Blackbuck in Bhal habitat was undertaken by the Forest department in cooperation with members of the Wildlife Conservation Society of Bhavnagar. The method

Blackbuck.

adopted was by visual count as an aerial census was found to be too expensive (though probably more accurate). The Velavadar grassland measuring almost 1785 ha. and forming the National Park area, had the largest number of antelope. The former sanctuary as established in 1969 covered 890 ha. In this area, including the buffer zone, a total of 1554 Blackbuck were recorded as follows: Male 338; Female 1052; Young ones 164. In the surrounding countryside: Male 31; Female 72; Young ones 19. Total 122. Thus the total census figures are 1676 antelope. Much of the surrounding areas contained isolated small groups.

The National Park limits are being extended and with habitat improvement should be suitable to hold a larger population of Blackbuck. The main menace is tribal poaching, followed by poaching from vehicles. Wolves occasionally claim some antelope, while drought impact has been reduced since water troughs have been made. Excessive rainfall in the area might have been the most significant controlling factor to the large herds in the past and may still be at present.

Since the park is not fenced, the antelope forage in croplands and this is a major problem during the winter season. Another problem is the spreading of *Prosopis juliflora,* a woody shrub which has invaded the park and unless checked will jeopardise the grassland.

A park lodge for visitors is being built and staff quarters are now completed. It takes about 1 hour and 45 minutes to reach the Park from Bhavnagar by a circuitous route via Ahmedabad highway and diversion after Valbhipur. A bridge over the Kalubhar as planned from Bhavnagar Port would bring the National Park within easy reach but at the same time create a danger from car poachers of Bhavnagar City. The present protective staff at the Park is wholly inadequate and unequipped to face such a danger. The sanctuary jeep is often used for other purposes and the staff has neither firearms nor binoculars for spotting Blackbuck and poachers. A walkie-talkie and more guard posts are a necessity in such a wide area. With the private grassland of Mithapur plowed, the Park has been reduced in its habitat and carrying capacity.

The necessary measures to improve the National Park must be taken to ensure the safety of the last large herd of Blackbuck in Gujarat State.

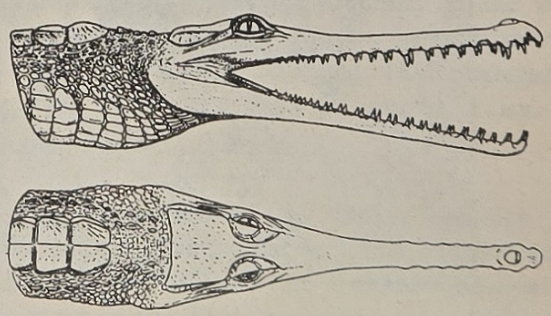
The author is Regional Secretary of wildlife, West Zone, government of India. His address is: Dil Bahar. Bhavnagar 364002 India.

FALSE GHARIAL

Mr. Romulus Whitaker, the crocodile and snake expert and director of the Madras Crocodile Bank, is conducting a survey on the False gharial *(Tomistoma schlegelii).* Mr. Whitaker and his wife are currently collecting data and have come to the conclusion that there is still very little known about this mysterious crocodile.

Therefore they request any information pertaining to crocodilians and in particular to the False gharial. Information on its occurrence, abundance, any official or unofficial reports or published research findings, will greatly contribute to the better understanding and ultimately to the conservation of the False gharial and its habitat.

Mr. Whitaker especially directs his appeal to our readers in Indonesia, Malaysia and Thailand. So if you know of False gharial in your area, please contact Mr. Whitaker. His address is:
Madras Crocodile Bank
Vadanemmeli Village, Perur Post
Mahabalipuram Road, Chingleput District
Tamil Nadu, India



Khao Yai National Park, Thailand (Vollmar).

THAILAND LAUNCHES EXTENSIVE REAFFORESTATION PROGRAM

by Boonsong Lekagul and Jeffrey A. McNeely

The Government of Thailand has launched a very extensive reafforestation plan to counter the rapid process of forest depletion. The speed with which the deforestation process takes place is still a subject of discussion, but nobody involved in the forestry business has any doubts about the fact that it is going dangerously fast.

The Government has realised that, in order to reverse the present trend, it is not enough to reduce timber cutting, since the major part of the forest products are used as fuel by the fast-increasing population.

Being aware of the fact that the pressure on the natural forests can only be reduced by offering an alternative source of fuel, the present program of planting 320,000 ha of forest per year has been launched. 320,000 ha per year is certainly a tremendous effort, but regarding the present rate of destruction, it has to be considered as a minimum.

Forests in Thailand are the base of its wildlife habitat. Therefore wildlife managers have to look further ahead than only at how they can cope with their work in the next couple of years: they should look so far ahead, that they still have the time to solve problems which are time-consuming.

Solving or preventing the futural lack of firewood certainly takes time. We sincerely hope that it will not take so much time that the result will be a lack of wildlife, watershed and still: lack of firewood.

To illustrate the background on which the Thai government has based its reafforestation program, Boonsong Lekagul and Jeffrey McNeely have analyzed the data on wood consumption and deforestation in Thailand to write the following article:

Based on current rates of consumption the last forest in Thailand will be cleared sometime in early 1987, just nine years from now, unless the trends of forest destruction are quickly and radically reversed.

Are we just being alarmists, or is there a solid basis on which such projections can be made? Official Forest Department statistics are based only on the permits issued for cutting of the approximately 250 reserved species of trees, or for permits issued for production of charcoal and cutting of firewood. As all foresters in Thailand know, such statistics do not reflect actual consumption, since both villagers and the operators of the 684 sawmills in Thailand generally honour the forestry laws more in their breach then in their observance. As late as 1974, the Forest Department was claiming that there were still about 25 - 27 million ha of forest remaining in Thailand, but this figure was strongly challenged with the development of objective means of determining the forest area of the country: satellite imagery from the Earth Resources Technology Satellite, ERTS-l. Based on this new technology, Boonyobhas and Klankamsorn (1976) reported that the area of forest remaining in Thailand in 1973 totalled just 20,074,900 ha, or 38.61 percent of the country; however, even this figure is over-optimistic since much forest has been cleared in patches too small to be detected by satellite. But is this anything to worry about? After all, most of these forests have been cleared for the growing of sugarcane, cassava, and maize, which together earned nearly US$ 700 million in 1974 (Ministry of Agriculture statistics). This is, of course, in addition to the earnings from the cut timber and the wildlife harvested from the cleared area. In fact, if the forested area were a stable 35 to 40 percent of the country, and harvests of wood were in balance with production, there would be little cause for alarm.

Unfortunately, the situation is very much worse than this, since there are strong indications that the pressure on the forests will continue to increase as the population grows and the technological means of forest clearing become more widespread. Backer and Openshaw (1972) conducted a very detailed study of consumption of wood products in Thailand, including interviews with 6000 households in both rural and urban areas in all parts of the country, as well as surveys of temples, industries, hot food stalls, street traders, furniture manufacturers, boat yard, funeral box makers, and building contractors, giving the most accurate possible picture of actual consumption of wood products in Thailand (see Figure 1).

Backer and Openshaw concludes that consumption of wood and wood products in Thailand

FIGURE 1.
THAILAND CONSUMPTION OF WOOD AND WOOD PRODUCTS, 1970

(Source: Backer and Openshaw, 1972)

Product		x 1,000 m^3
1.	Sawnwood	
	Household	2,450
	Furniture	150
	Miscellaneous	250
	Industrial	1,240
	Social and Services	210
	Subtotal	4,300
2.	Poles (structural)	
	Household	925
	Industrial	487
	Social and Services	68
	Poles (non-structural)	
	Household	788
	Industrial	48
	Social and Services	14
	Subtotal	2,330
3.	Fuelwood and Charcoal	
	Household	44,800
	Industrial	3,700
	Social and Services	500
	Subtotal	49,000
	Total	55,630
	ROUNDWOOD REQUIREMENTS (AFTER FELLING)	
	Sawnwood	12,000
	Poles	2,500
	Fuelwood Requirements	49,000
	Total	63,500

was 55.63 million m^3 in 1970, of which fuelwood comprised 88.1 percent. They estimated that the total requirements of roundwood after felling was 63.5 million m^3, and that consumption would increase at about the rate of population growth (2.7 percent/year). They determined that the volume of wood per hectare for all types of forests averages 48 m^3 of trees over 30 cm diameter at breast height, while the volume of the smaller trees was less than half that of the sawlog size; thus the total volume of wood per hectare is no more than 72 m^3, a rather low figure reflecting long-term pressure on the forests.

Even if we assume that *all* wood is being

utilized (FAO, 1976, estimate that about 30 percent should be added to removals to arrive at standing volume equivalent, so our assumption is very conservative indeed), the amount of forest area required to supply the 63.5 million m^3 required in 1970 is 881,944 ha. To this must be added a minimum of 255,000 ha for shifting cultivation (though FAO, 1976, suggest that the figure could easily be twice this high) giving a total area of forest cleared in 1970 of 1,136,944 ha. This may be a somewhat conservative figure, since Boonyabhas and Klankamsorn estimate that about 7.1 percent of the forest would be cleared in 1974, giving a figure of 1,425,317 ha (as opposed to our estimate of 1,264,795 ha in that year). Based on a growth of consumption of 2.7 percent/year, we have calculated the area of forest cleared from 1970 to 1987 (figure 2), and the area of forest remaining.

It can be noticed that whoever makes an estimate on the timing of Thailand's forest clearing, comes to a different date of total clearance. But all reasonable estimates fall within a 5 year margin around the estimate given above. It is not so much the exact *date* at which the last forests are felled what is important, but that it is going to *happen*, and pretty soon.

The figures may be excessively pessimistic. Certainly, some forests will remain intact because of their inaccessibility, and firewood and charcoal do not all come from newly-cleared forest so our figure may be somewhat high in this regard. Other authorities give figures somewhat below ours; the Royal Forest Department, for example, considers that about 400,000 hectares are being cleared annually. Given all the imponderables, the "true" rate of forest clearance in Thailand is probably somewhere between the RFD figure of 400,000 ha/yr and our projected figure of about 1.26 million ha/yr.

FIGURE 2.

CONSUMPTION TRENDS OF THAI FORESTS

Year	Area of Forest Cleared (ha)	Area of Forest Remaining (ha)
1970	1,136,944	
1971	1,167,641	
1972	1,199,167	
1973	1,231,544	20,074,900*
1974	1,264,795	18,810,105
1975	1,298,944	17,511,161
1976	1,334,015	16,177,146
1977	1,370,033	14,807,113
1978	1,407,023	13.400,090
1979	1,445,012	11,955,078
1980	1,484,027	10,471,051
1981	1,524,095	8,946.956
1982	1,565,245	7,381,711
1983	1,607,506	5,774,205
1984	1,650,908	4,123,297
1985	1,695,482	2,427,815
1986	1,741,260	686,555
1987	1,788,274	0

* Figure from Boonyobhas and Klankamsorn, 1976.

Mangroves at Suratthani, Thailand (Royal Forest Department).

But whatever the current rate, forest clearance is bound to increase as wood becomes more valuable, the human population increases, and means of production are improved. If nothing is done, there will be no significant production forests left in Thailand within 5 to 15 years.

But is the situation really so hopeless, or can something be done to save the remaining Thai forests? While there is little room for optimism, we still can harbor some hope. The current Thai government is well aware of the seriousness of the situation and is taking strong steps to try to improve forest conservation in Thailand. There is already an outstanding system of national parks and game reserves, totalling 2,472,000 ha (4.83% of the country), wherein all extractive activities are proscribed (though not necessarily halted). Bans of exports of logs and lumber is being considered. New sources of fuel are being investigated, including nuclear energy and natural gas, and many villages are being electrified from hydroelectric dams, thus at least potentially reducing reliance on fuelwood and charcoal. Steps are also being taken to reduce the area under slash-and-burn cultivation, through crop substitution programmes which would concentrate the hill tribes in permanent villages growing commercial crops on the most suitable agricultural land, the marginal land would then be allowed to revert to forest.

But all of these efforts are bound to fall short of requirements unless there is a series of strong reafforestation projects, and this is an important part of the Thai government's economic development programme. Slash-and-burn farmers will be encouraged to plant a tree crop with their other crops, "forest villages" are being established, fuelwood plantations may be planted in many areas which have already been cleared of forest for short-term agricultural uses, and research will continue into fast-growing local species of both softwoods and hardwood. In total, the government plans to reafforest 320,000 ha per year over the next five years. While this still falls short of the area being cleared every year, it is far beyond the current rate of reafforestation by the Royal Forest Depart-

Doi Inthanon, Thailand.

ment, and is an expression of concern on the part of the government. (By the end of 1976 the total man-made forest in the country covered only 94,000 ha).

In the final analysis, the depletion of the forest resource is another example of the "Tragedy of the Commons" (Hardin, 1968), where a potentially renewable resource is being abused, even destroyed, because nobody really has control over its use. The forests of Thailand are too important to be considered just the business of the Forest Department, they must be seen as belonging to the people of the country, and each village should have its own production forest to meet its own needs for firewood and construction. Forestry should be seen as one of the cornerstones of Thailand's rural development programme, and there is every indication that the government is trying to support this concept.

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HAS NO ONE THOUGHT OF THE FIREWOOD ?

by T.W. Hoffmann

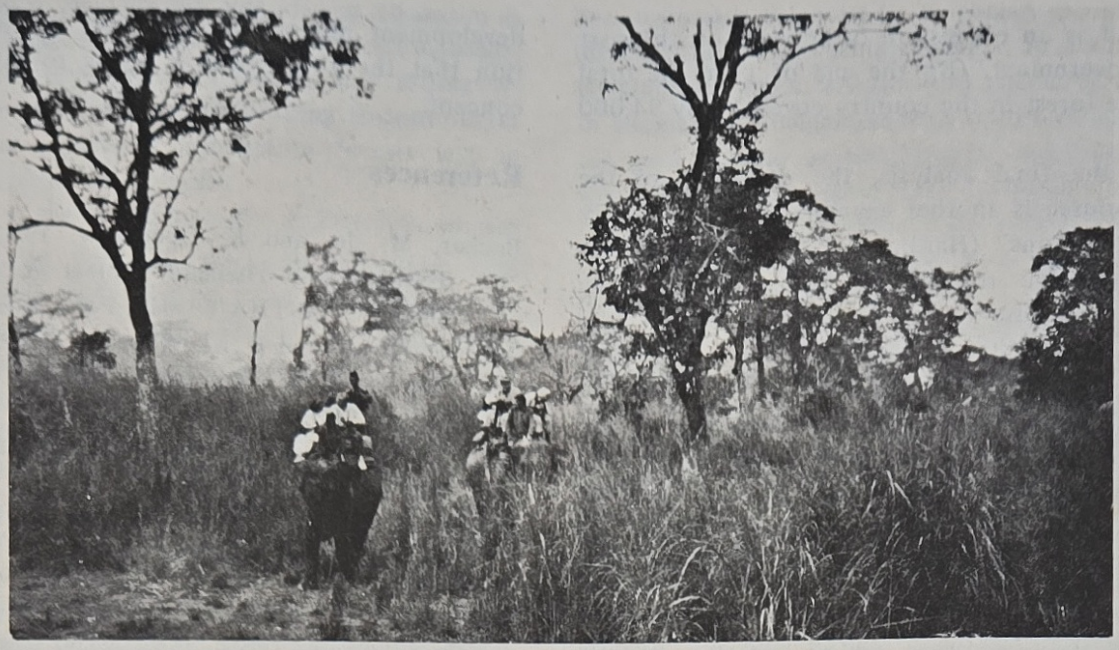
In the context of massive development and colonization schemes, our indigenous forests have been ruthlessly and totally destroyed over vast areas, especially in the dry zone. In the wet zone the process has been different, slower but no less insidious. The result is that there are no more forests even where there should be forests.

This has particular relevance to the *village economy to the needs of the people* in these very colonies which have been created in such an artificial way. The rural population and even people in towns depend even today to a great extent on the availability of cheap firewood. If it is not available, they obtain it illegally, resulting in the vicious circle which destroys our forests.

One wonders where our planners and technocrats have got their roots? Not one of them ever seems to have thought about such an obvious matter. No one has planned for *village forests,* areas specifically set aside for each hamlet, each village, which would satisfy the needs of the people for forest produce, not only firewood, but sticks, tool handles, materials for simple buildings, roofing, etc. We now find that foreign experts have to remind us of this obvious need; two American ecologists have in fact been sent here to check up whether village forests are included in the planning and execution of the mammoth Mahaweli Ganga Diversion Scheme which is partly financed by the U.S. There is something singularly amiss if foreigners have to come and remind us that it is necessary to consider these *traditional needs of the village people* in our planning and in the development of the country.

Naturally village forests have important secondary benefits. They act as wind belts and as balancing factors in regard to water, climate, temperature, humidity of the air. The benefits derived from well planned village forest (whether natural or plantation forests) cannot be overstressed. We invite anyone interested in this subject to visit *Uda Walawe* and try to locate a single village forest in that vast area which has been described as a "green desert". Uda Walawe is the latest most grandiose creation of our technocrats. How sad!

from **Wildlife and Nature Protection Society of Ceylon Newsletter**
no.40 August 1977



Chitawan National Park (Jackson).

NATIONAL PARKS AND WILDLIFE RESOURCES

Summary of a secretariat paper, prepared by FAO, Rome, for the tenth session of the Asia-Pacific Forestry Commission held in Kathmandu from 6 till 10 June 1977.

Introduction

Since the Ninth Session of the Asia-Pacific Forestry Commission in 1973, changes have taken place in the region: the human population has increased, development has involved depletion of natural resources, pressures on remaining natural areas have increased. However, at the same time, there are many signs that the considerable reduction of resources that were once thought to be abundant has generated a greater awareness of the value of national parks, wildlife resources and in general of all the non-wood values of forests and wildlands in the region. There are interesting developments in the economic utilization of nature and wildlife resources at the national level, while international action has selected species (tiger) or ecosystems (tropical rain forest) as subjects for concentrated effort and publicity programmes.

Conservation

Although the primary objective of the establishment of national parks is often conservation, priority management for conservation can only be restricted to those areas where plant or animal species are threatened with extinction in a limited area, for example Ujong Kulon Reserve in Western Java, Indonesia, for the last remaining Javan rhinoceros; and the Gir Sanctuary in India, for the Asiatic lion. Here, human interference should be minimal. Proper demarcation and sufficient law enforcement personnel are essential. Whenever possible, buffer zones are required to supply surrounding villages with products traditionally derived from the areas now closed to them. Alternatively, forest plantations have to be established for fuelwood and building poles.

Tourism and recreation

In the Asia-Pacific Region the conditions of terrain and vegetation are often such that specific measures have to be taken to satisfy tourism and recreation expectations. Artificially created grazing grounds and the use of artificial salt licks and/or baits have successfully been used in Malaysia, India, Nepal and other countries.

Emphasis on a total ecosystem experience by tourists, rather than selected species orientation, is one of the major requirements for visitors'

satisfaction in Asia-Pacific national parks and one of the methods of achieving this would be the use of boat trips. Another typically Asian way of exploring forested areas is by the use of elephants.

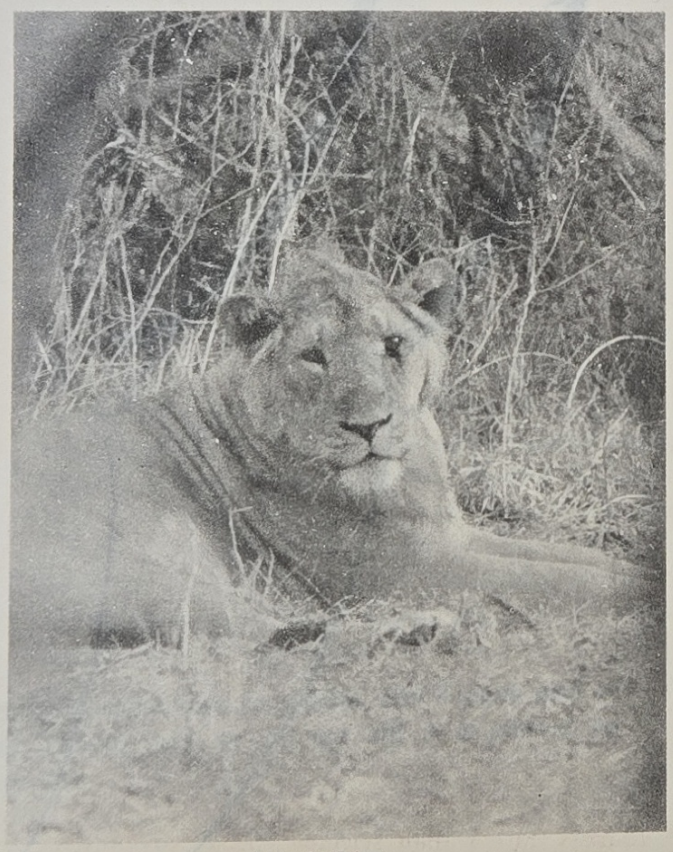
Wildlife management

As in many other parts of the world, far more wildlife occurs outside the boundaries of legally protected reserves, than within them. But it is here that there is the greatest threat of irrational utilization of the resources, basically because no management policies have been formulated or put into practice.

The Asia-Pacific Region has a long-standing tradition of consumptive utilization of wildlife, either in its wild form or under domestication. There are three main aspects on which attention should be focused; hunting, deer farming and crocodile management. Other activities, such as turtle egg collecting, bird's nest collecting, are locally important.

Reconciliation of forest, watershed and wildlife management

The large-scale exploitation, in particular, of the tropical moist forest during the past decade has given rise to much concern among nature conservationists in the world. Direct effects on the wildlife populations are often a result of uncontrolled hunting by loggers and the facilitation of access to these areas, on top of this comes the change in vegetation. There seems to be a need for better coordination in law and management between forest and wildlife administrations, to the benefit of both.



Asiatic Lion.

Training

Management of national parks and wildlife requires an extensive knowledge of the resources to be managed and adequately trained personnel are a prerequisite for ecologically based management.

Malaysia, Indonesia and India have initiated activities related to the establishment of middle-level training schools.

Higher level training at universities caters for the requirement of professional staff in the field of management and research of national parks. This training is recently only available in a very few developing countries and most students currently study in Europe and North America. Such training suffers from the inherent drawback that it is geared to temperate ecosystems in developed countries. The long-term solution to the problem must lie in the development of appropriate courses in countries of the region.

In 1976 the governments of Australia, New Zealand and Papua New Guinea organized a very successful three-month course on management of national parks and wildlife in the three countries. This course will be held again in 1978.

Research

Research in wildlife management is highly desirable because, very little is known about wildlife outside national parks and reserves. Subjects for research could include:

(a) The contribution of wildlife to protein supply in rural areas.
(b) The relation between forest and wildlife management and the effects of forest exploitation on habitat modification and species survival.
(c) Deer farming at small farmers' level.
(d) Crocodile management.

Working Party

The establishment of a Working Party or Committee of the Asia-Pacific Forestry Commission might be considered, to promote exchange of experience among senior administrators of wildlife and national parks resources in the Region.

ON THE DIFFERENCE IN THE FOOT PRINTS OF THE JAVAN AND THE SUMATRAN RHINOCEROS

by Nico J. van Strien

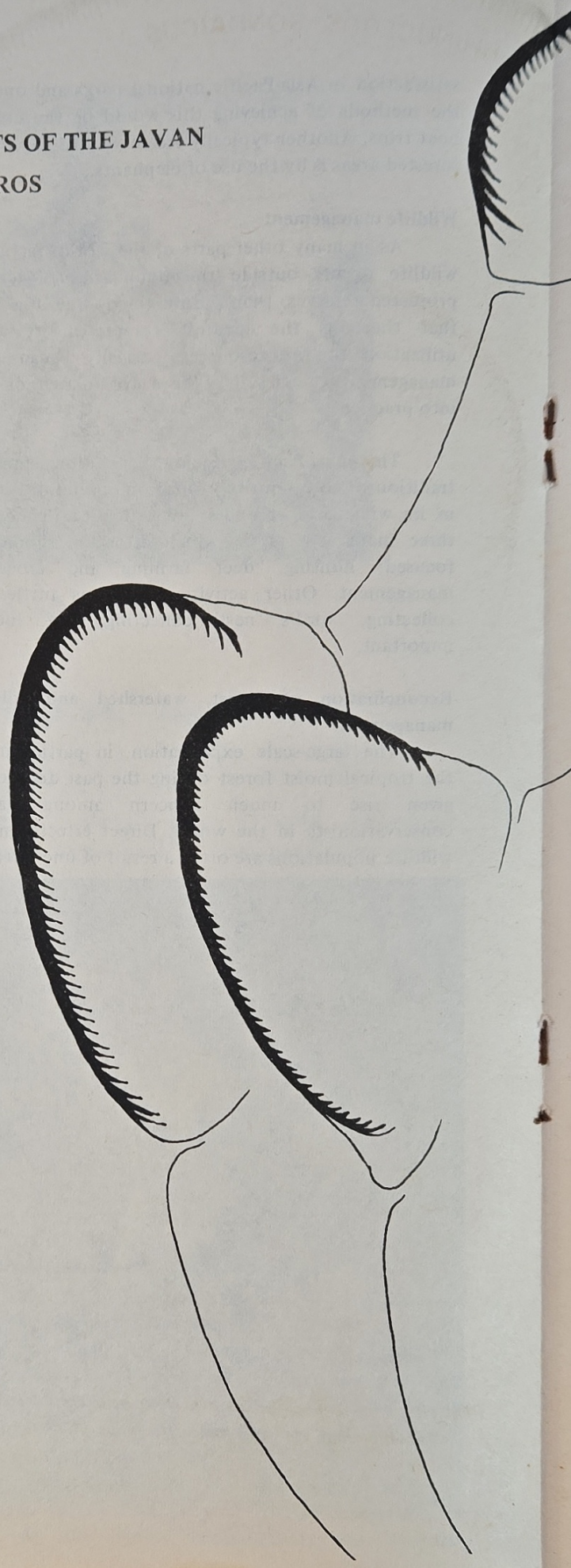
In historic times two species of rhinoceros, the Javan rhino *(Rhinoceros sondaicus)* and the Sumatran rhino *(Dicerorhinus sumatrensis)* inhabited most of the Southeast Asiatic region, from the greater Sunda islands to the Brahmaputra valley and southern China. Now only a small number remain, living in small and isolated groups in a few reserves and some remote places, and both species are among the rarest and most threatened mammals.

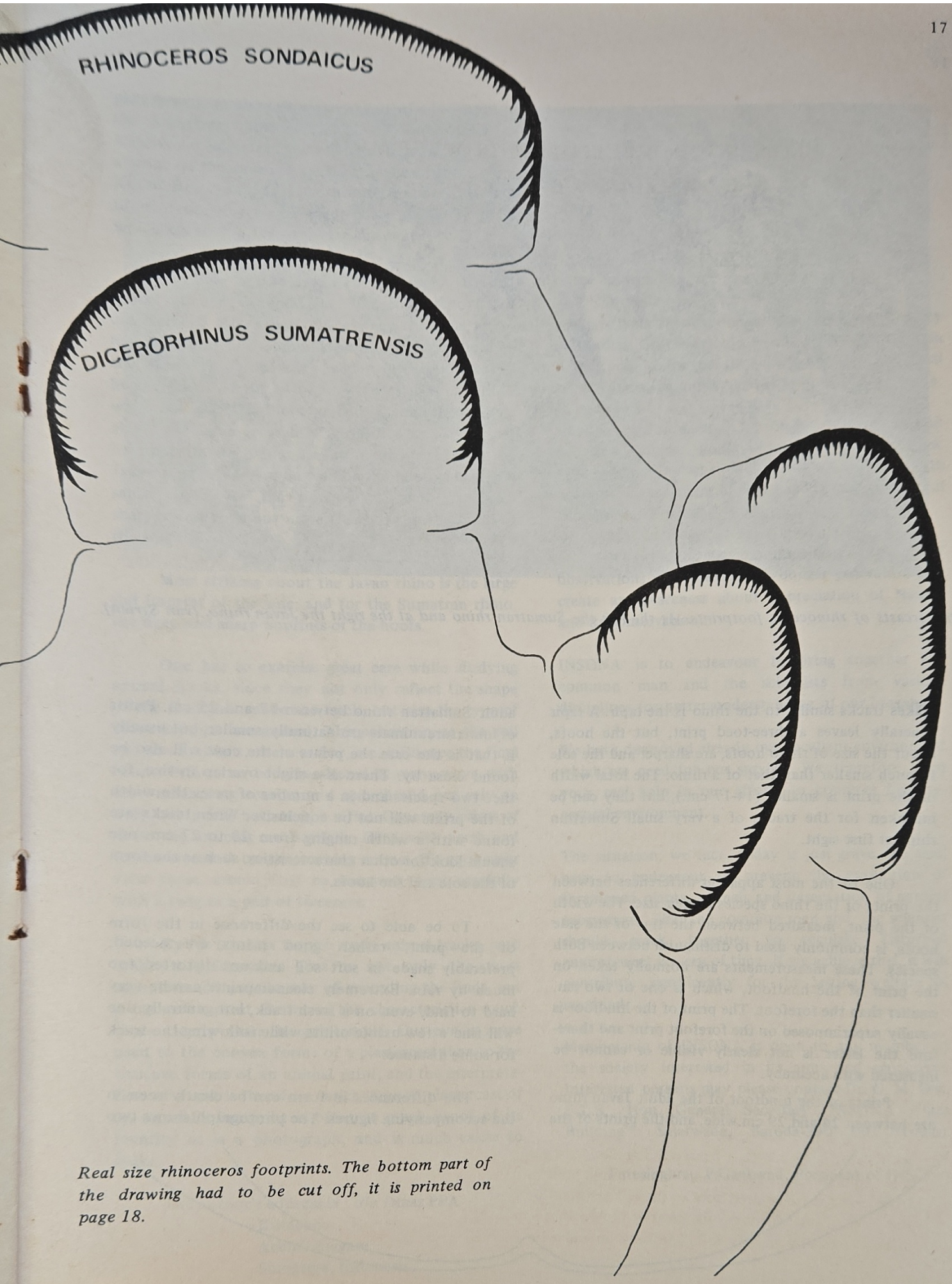
The distribution of both species overlapped throughout most of their range and, although some ecological differentiation between the species exists– the Javan species is more confined to lower, flatter and opener country than the Sumatran species–both species could occur in the same area. Both lived in the forest or in dense growth and were seldom seen. The best evidence for their occurence were the tracks, left behind on suitable places. Distinguishing between the two species was difficult even on sight in the dim light of forest, and many reports referred only to 'rhino', leaving the species an open question.

Nowadays the chances of coming across the tracks of a Javan rhino outside their last known refuge – Udjung Kulon on Java – are extremely small. The Sumatran rhino has a much wider distribution and most of the recent reports refer to this species. But now and then the Javan species is also mentioned, and there is a chance that a few have escaped the massacre in Sumatra, Thailand or Laos. On the other hand, the evidence brought forward with regard to the identification of the species is generally unsatisfactory and there remains much doubt as to the accuracy of such sightings.

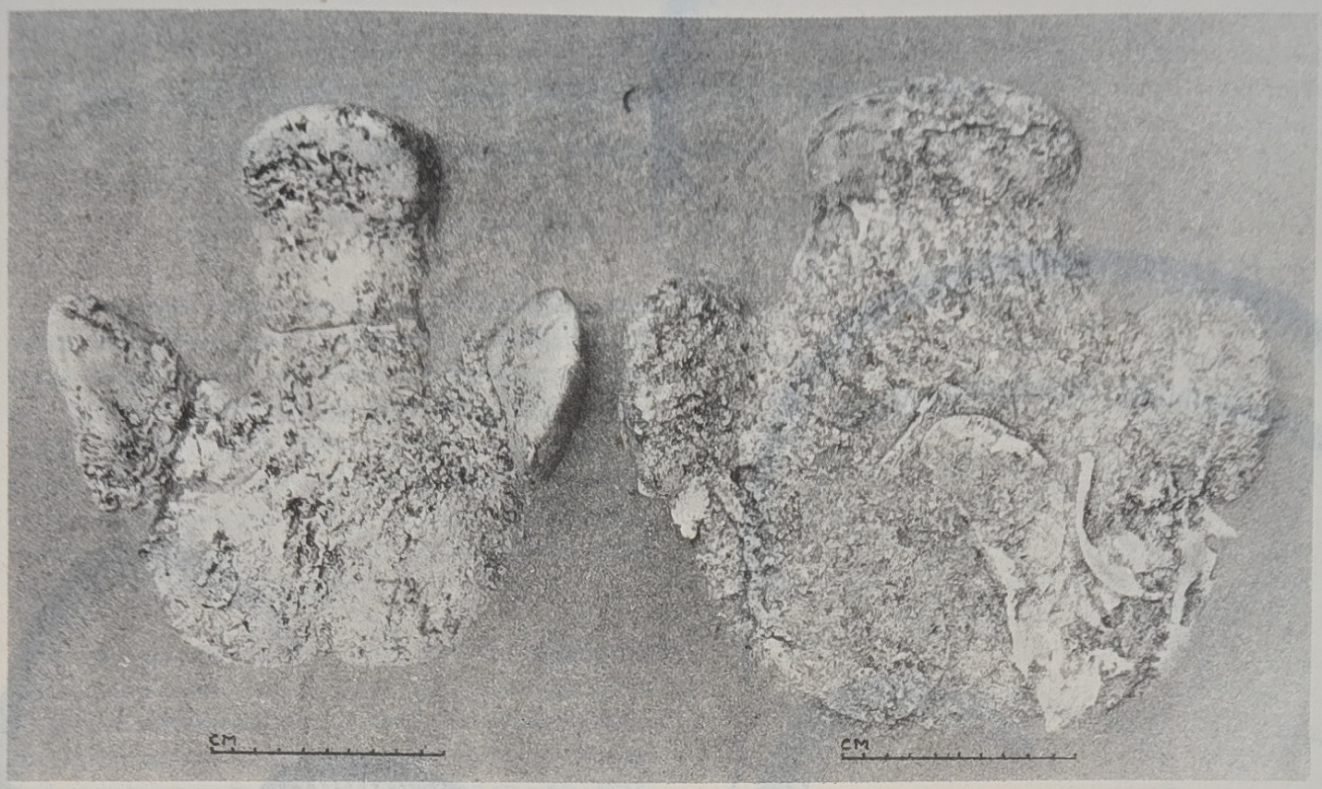
Differences do exist between the tracks of the Javan and the Sumatran species and in order to increase the accuracy of the reports on 'rhino' sightings this article will discuss how to distinguish between the tracks of the two species.

Rhino's have feet with a characteristic flat, circular sole and three large nails or hoofs: a half round hoof in front and a more pointed hoof to the left and right of the sole. These features are clearly visible in the prints, especially in soft soil. The only animal who





Real size rhinoceros footprints. The bottom part of the drawing had to be cut off, it is printed on page 18.



Plastercasts of rhinoceros footprints. At the left the Sumatran rhino and at the right the Javan rhino. (van Strien).

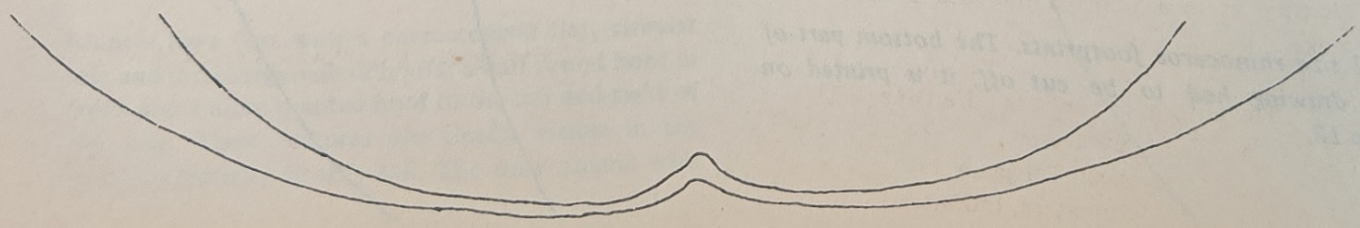
makes tracks similar to the rhino is the tapir. A tapir generally leaves a three-toed print, but the hoofs, about the size of rhino hoofs, are sharper and the sole is much smaller than that of a rhino. The total width of the print is smaller (14-17 cm.), but they can be mistaken for the tracks of a very small Sumatran rhino at first sight.

One of the most apparent differences between the prints of the rhino species is their size. The width of the print, measured between the tips of the side hoofs, is commonly used to distinguish between both species. These measurements are normally taken on the print of the hindfoot, which is one or two cm. smaller than the forefoot. The print of the hindfoot is usually superimposed on the forefoot print and therefore the latter is not clearly visible or cannot be measured with accuracy.

Prints of the hindfoot of the adult Javan rhino are between 24 and 29 cm.wide, and the prints of the adult Sumatran rhino between 17 and 25 cm. Prints of immature animals are naturally smaller, but usually if that is the case the prints of the cow will also be found close by. There is a slight overlap in size, for the two species and in a number of cases the width of the prints will not be conclusive. When tracks are found with a width ranging from 23 to 27 cm. one should look for other characteristics, such as the form of the sole and the hoofs.

To be able to see the difference in the form of the print, rather good prints are needed, preferably made in soft soil and not distorted too much by rain. Extremely clear imprints can be very hard to find, even on a fresh track, but generally one will find a few usable prints while following the track for some distance.

The differences in form can be clearly seen in the accompanying figures. The photograph shows two



plastercasts; to the left a plastercast of a footprint of the Sumatran rhino, made in the Gunung Leuser Reserve on Sumatra, and to the right a plastercast of a print of the Javan rhinoceros, made in the Udjung Kulon Reserve on Java, both on the same scale. The life-size drawings were made after the same casts, which are good averages in size and shape.

The sole of the Javan rhino is very flat and almost circular, whereas the Sumatran rhino has a more arched sole, especially between the nails, forming something like a 'middle finger'. The fronthoof of the Javan rhino is much wider in relation to its height, being about twice as wide as it is high. The width of the fronthoof of the Sumatran rhino is about the same or slightly more than its height, and its imprint is much more pronounced than in the Javan species, as can be seen on the photograph. The same applies to the sidehoofs, which are much sharper and stick out more clearly from the plane of the sole.

Most striking about the Javan rhino is the large flat imprint of the sole, and for the Sumatran rhino, the deep and sharp imprints of the hoofs.

One has to exercise great care while studying animal tracks, since they not only reflect the shape of the foot that made the track, but also the type of movement of the animal. The condition of the soil and the gradient, the weather, etc. influence the final result. Prints can become altered in many ways, with very misleading results, and one should not rely on only one print, but study a series. Generally prints of these big animals are partially filled with earth and leaves loosened by the walking animal. To get a clear view these should first be removed very carefully with a twig or a pair of tweezers.

By far the best way to study animal tracks, is to make a plastercast. This is not only the most complete and precise way of recording the finds, but a cast of a print shows us the characteristics much more clearly than the print itself. Our eye is more used to the convex forms of a plastercast than to the concave forms of an animal print, and the interpretation of a cast is therefore easier. A good plastercast of an animal's footprint is often as much proof of its identity as is a photograph, and is much easier to make.

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Sumatera, Indonesia

INSONA

We have, very recently, established the Indian Society of Naturalists (INSONA), with its headquarters in Baroda, to advocate the cause of environmental conservation for improving the general quality of life.

INSONA will co-operate with other Institutions and Societies, having similar objectives, and will seek affiliation to national and international bodies to promote advancement of study and research in natural and applied sciences.

INSONA will provide opportunities for field observations and research to younger generation and create an awareness about appreciation of Nature and its conservation.

INSONA is to endeavour to bring together the common man and the scientists from various disciplines for better understanding of our biosphere.

We have destroyed already our excellent environment which we need for our survival. We, therefore, need your real help in our efforts to conserve healthy, natural environment.

The situation, we face, today is just grave. We shall have to endeavour to prevent the extinction of threatened plants, animals and desecration of natural ecosystems. That the common man and the scientist should work together to regulate disturbed environment is a cry of time. If we achieve this, it will contribute significantly for the lasting welfare of mankind.

Membership of INSONA is open to any member of the society interested in its aims and objectives. Interested persons may please contact Dr. G. M, Oza, F.L.S., Hon. General Secretary INSONA, "Oza Building". Salatwada, Baroda-390 001 (India).

Fatesinghrao P.Gaekwad, President of INSONA

IUCN/SSC ASIAN ELEPHANT GROUP

NEWS NO 2

SSC GLOBAL STRATEGY FOR THE CONSERVATION OF ENDANGERED SPECIES

Despite the fact that the IUCN Survival Service Commission has in the past played a remarkably successful role in saving a large number of species from extinction, it is now felt that we cannot continue to address wildlife conservation in a piecemeal fashion, moving from one crisis to the next. We must attempt to develop a comprehensive programme for the conservation of all threatened species, and we must try to anticipate problems before they arise or reach the crisis level.

If such a programme were in hand, we could better determine how funds should be allocated, what personnel was available, which projects demanded immediate attention, and which could be delayed, and which held the greatest promise of saving wild species. It would permit IUCN and WWF to mount a truly global strategy for conservation.

For this reason, all Specialist Groups have been called upon to produce and Outline Master plan for the conservation of the species under their purview. The individual Master Plans will then be elaborated and later combined into a Global Strategy for Conservation of Endangered Species.

OUTLINE MASTER PLAN FOR AFRICAN AND ASIAN ELEPHANTS

Under the auspices of a current IUCN/WWF project (No. 1389) entitled "Elephant Survey and Conservation Programme," (also funded by New York Zoological Society), the two specialist Groups concerned have now produced a joint Outline Masterplan for the elephants of both continents. The relative priorities of the different projects have yet to be finalised, but projects will only be weighed against others concerning the same species.

Dr. Iain Douglas-Hamilton and his colleagues have created a matrix of suggestions for elephants, modelled on the IUCN/WWF "The Seas Must Live Campaign", See **Tigerpaper** 4(1):29–36). It is divided into four major sub-programmes concerned with Conservation, Economics, Education and Research.

A fifth sub-programme lists on-going or planned research supported by other organisations, as a background for assessing priorities. Within the matrix each country is allocated space for its own action plan under the four sub-programmes. The intention is to provide a skeletal frame-work which will be filled out as the on-going survey uncovers fresh priorities.

Where possible we have identified problems and suggested remedial action, though in most cases it is not yet possible to attach a cost to these. The listing of a proposal does not imply that further screening is unnecessary.

Since we believe that the IUCN elephant programme should embrace any problem concerning the elephant or its environment, we expect that many of the issues raised have already come to the attention of the IUCN. However, we feel that even if these are already included within existing programmes (e.g. the IUCN/SEAP – South East Asia Action Programme – see also **Tigerpaper** 4(2):26–33) that the elephant's appeal could be used to raise funds where the targets have not yet been met.

Listed below is a summary of the suggested sub-programme components as concern Asia and the Asian elephant, within the overall Outline Masterplan of the two Groups. Projects or Action Priorities already partly or wholly covered by WWF Project No. 1389 are marked with an asterisk.

1. Conservation of elephant populations and their habitats.

The Conservation sub-programme is concerned with direct means of protecting elephants and their habitats.

Bhutan

–Protection and management of Bhutan Manas Reserve.
WWF Project 1022 US$ 35,000.

India

–Radio network for Jaldapara Wildlife Sanctuary.
WWF Project 1388 US$ 10,750.

–Ecological monitoring station for Bandipur/ Mudumalai Sanctuaries.
WWF Project 1394 US$ 18,000.

Indonesia

–Establishment of effective management of the Berbak Reserve.
WWF Project 1515 US$ 25,000.

Malaysia

Status survey of Krau Game Reserve.
WWF Project 1177 US$ 7,200.

Thailand

–Improvement of ranger facilities at Khao Yai.
WWF Project 1019 US$ 100,000.

–Consolidation of Kha-Khaeng and Tung Yai Sanctuaries (Tenasserim Elephant Range).
WWF Project 1020 US$ 115,000.

2. Regulation of the use of elephants and their products.

Elephants as a main attraction within Parks and Reserves have economic value. They can also generate income from the sale of licenses to shoot them, and from their meat and skin. Presently they are mainly killed for the sake of their ivory. Until the vertical structure of the ivory trade is more fully understood, it will be difficult to identify points at which

Ivory dealer. Better knowledge of the ivory trade is needed in order to regulate it. (Photo Olivier).

economic control and regulations can be exerted. Legislation on buying, selling, and exporting of ivory will be required. In Asia legislation on the capture, ownership, and use of domesticated elephants may also be desirable.

India

–India and the Elephant and Ivory Trade.
Action priority US$ 1,500
(M.A. Parthasarathy).

Asia – General

–Reccomendations for legislative control of ivory and ivory products.
Action priority

–The economic role of the domesticated elephant on developing Asian nations.
Action priority (Asian Development Institute).

Worldwide – General

–Production and marketing of artificial ivory.
Action priority

–Implementation of Washington Convention concerning ivory regulations.
Action priority (*)

–Investigate and encourage formation of ivory exporters' cartel.
Action priority (*)

3. Education and Public Awareness.

This sub-programme aims at basic grass roots education, on the intrinsic values of elephants as a cultural asset, which is one of the vital keys to their long term survival. However, more immediately important is lobbying political leaders and administrators to view elephants as a valuable, self-sustaining economic resource. To develop this awareness among leaders is one of the major objectives of the proposed elephant conference. Since elephants have strong symbolic value they can be used in existing educational programmes to convey general principles of conservation.

Asia – General

–Group Secretariat.
Project * US$ 3,000 p.a.

–Group Meetings.
Action priority (*) US$ 3,000 p.a.

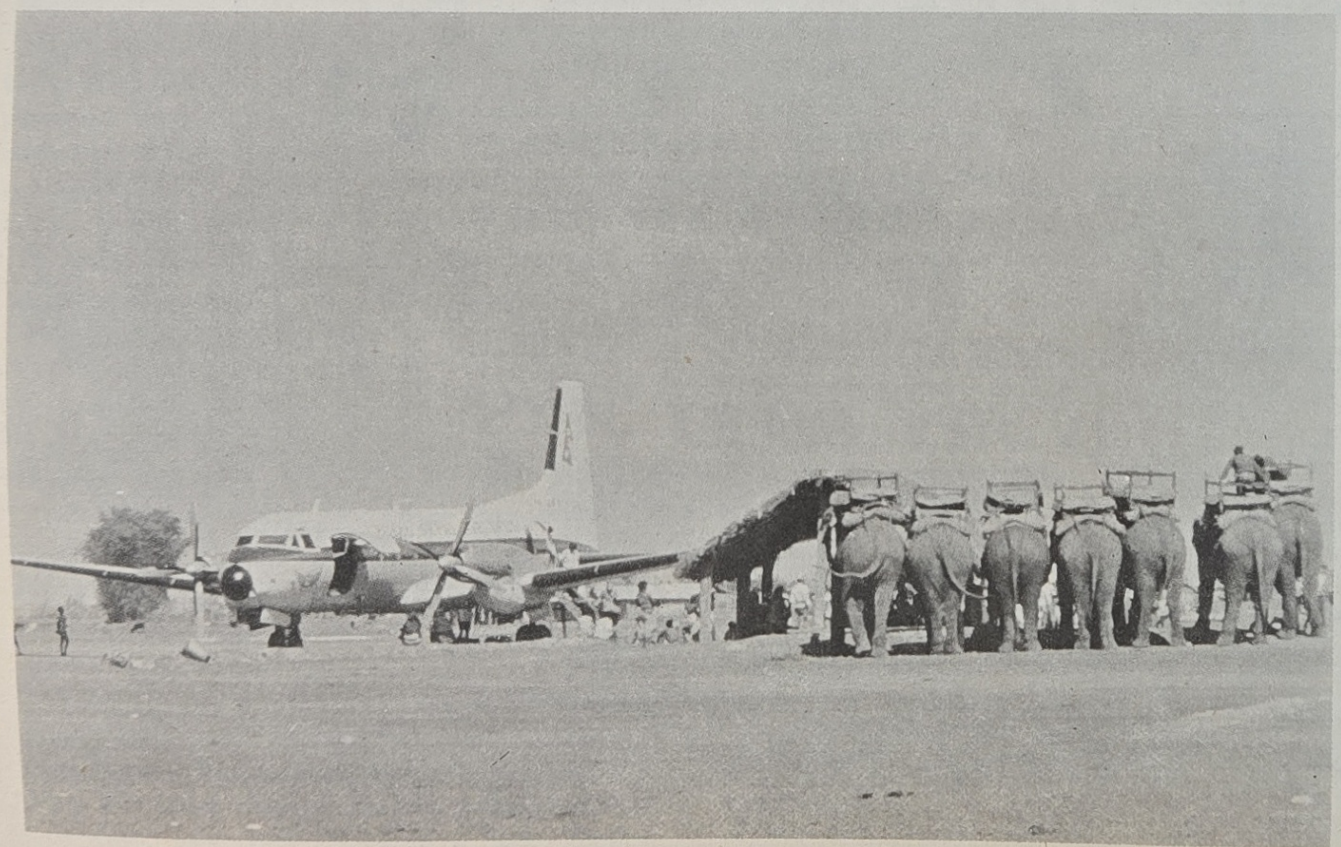
Worldwide – General

–Educational books on elephant folk-lore.
Action priority

–Elephant library and information service. *

–Elephant domestication in Africa.
Action priority

–International Conference.
Project US$ 400,000



Elephants can be invaluable for presenting themselves and other wildlife to local and foreign people. (Photo Boulton).

4. Research Proposals.

The aim of this sub-programme is to develop an information network on the distribution and status of elephants in Africa and Asia as the basis for the IUCN Elephant Conservation Programme.

Bangladesh

–Survey of Himchari and Pablakhali Sanctuaries.
Action priority

China

–Survey of distribution and status of elephants.
Action priority

Burma

–Survey of population status of elephants.
WWF Action priority US$ 30,000
(IUCN/SEAP 1.1.1.)

India

–Status and population of the Asian elephant with special reference to India.
Project * US$ 6,500 (J.C. Daniel)

–Ecological studies in key area by local student.
Action priority US$ 2,000 p.a.

Indonesia

–Feasibility study on capture and training of elephants in Sumatra.
Project US$ 14,300

–Survey of distribution and status of elephants in Kalimantan.
Action priority

Kampuchea

–Survey of population status of elephants.
WWF Action priority US$ 60,000
(IUCN/SEAP 3.1 and 3.3)

Laos

–Survey of population status of elephants.
Action priority (IUCN/SEAP 4.1)

Malaysia

–Survey of distribution and status of elephants in Sabah.
WWF Action priority US$ 30,000
(IUCN/SEAP 6.2.1)

Sri Lanka

–Ecological studies in key area by local student.
Action priority US$ 2,000 p.a.

Thailand

–Thailand survey project for "Elephant Ranges".
Project US$ 19,000 (J.C. Leyrat).

–Ecological studies in key area by local student.
Action priority US$ 2,000 p.a.

Vietnam

–Survey of population status of elephants.
Action priority (IUCN/SEAP 5.1 and 5.2)

Asia – General

–Development of "Elephant Ranges" in South

Immobilized elephant with radio-collar in Malaysia. Better knowledge of the seasonal movements of key populations is vital for their conservation. (Photo Olivier).

Asia.
Project US$ 43,388 p.a.
(R.C.D. Olivier).

Worldwide – General

–International ivory trade study.
Project US$ 20,000

–Economics of ivory study.
Action priority

–Ivory exporters cartel feasibility study.
Action priority

–Radio-tracking by N.A.S.A. satellite.
Action priority

–Development of infra-red scanning techniques.
Action priority

5. Ongoing Research.

India

–Survey of elephant distribution and status in the Western Ghats.
(Dr. M. Gadgil, Mr. V. Kumar Nair. Indian Institute of Science; WWF India).

–Ecology and behaviour of elephants in Periyar Wildlife Sanctuary.
(Dr. Vijayan. Kerala Forest Research Institute).

Sri Lanka

–Ecological Studies of elephant and other species in the Gal Oya National Park.
(Mr. N. Ishwaran. Peradeniya Campus; Smithsonian Institution). Being written up.

Thailand

–Studies of elephant droppings in Salak Phra Sanctuary.
(Mr. G. Wiles. Royal Forest Dept; Peace Corps). Being written up.

Malaysia

–Crop protection from elephants.
(Mr. M. Munroe, Ms. L. England. Malaysian Game Dept., Peace Corps).

–Behavioural ecology in tropical rainforest.
(Mr. R. Olivier. Cambridge University. Nuffield Foundation; WWF). Being written up.

For further details of any of the above projects, or if you have proposals or suggestions for further additions or alterations to any of the sub-programmes, please write to the IUCN/SSC/WWF Asian Elephant Secretariat, c/o Dept. of Applied Biology, University of Cambridge, Pembroke Street, Cambridge CB2 3DX, England.

Elephant trench in India. More must be done to develop physical exclusion of elephants from agricultural areas. (Photo Olivier).

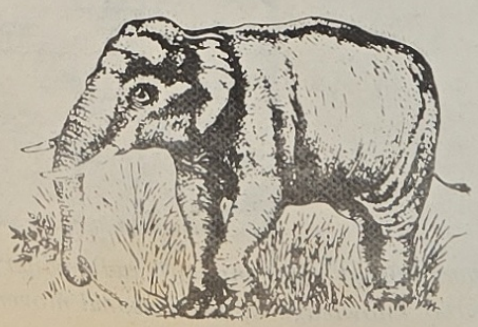
APOLOGIES FOR ERRORS IN LAST NEWS

TO

Mr. S.P. Shahi, of our Central Indian Task Force, wrongly referred to as "Mrs.".

Mr. John Paxton, the caption and credit for whose picture of a tusker on a road in Khao Yai N.P., Thailand, was accidentally omitted.

Mr. Robert Olivier, accidentally called "Rovert" in connection with his forthcoming text on the elephant.



FORESTRY FOR LOCAL COMMUNITY DEVELOPMENT

The Forestry Department of FAO in Rome has prepared a Working Paper for review at the FAO/SIDA Expert Consultation on Forestry for Local Community Development, which was held in Semarang, Indonesia, from 5–16 December 1977.

Although there is little direct connection with wildlife or national park management, there is a lot of indirect connection. The development of forestry at the community level would remove some of the pressure from natural forests, at least, this should be so when it is realized that the production of forest produce at the community level is also regarded as an alternative for the current destruction of natural forests.

Below we have reprinted a selected number of paragraphs from the above mentioned Working Paper. The reprinted text outlines some of the problems which have led to the idea of incorporating forestry in community development.

Introduction

Since the end of the Second World War, there has been considerable activity in the field of economic development. A great amount of money has been spent by governments and by the international and bilateral agencies in the pursuit of economic growth. The international agencies have been expanded, the number of staff made available to them has grown almost exponentially, and the developing countries have been subjected to a plethora of missions of experts, of one ilk or another, all devoted to assisting them to develop their economies.

And yet the degree of development in many countries of the Third World remains alarmingly low. There is still much poverty; there is still much under- and un-employment; there is still much malnutrition. In general, the conditions of the poor, both in the urban and rural areas have worsened. Where there has been some economic growth, it has occurred in an inequitable manner. The gap between rich and poor in many developing countries has increased, as it has between the developed and developing economies.

The roots of the problem of rural poverty are, in general, population growth and rising expectations. As long as populations remained stable over long periods of time, the way of life that had evolved to sustain them ensured adequate levels of production to satisfy perceived demands. However, in comparatively recent years, most countries have undergone rapid population growth, making it impossible to maintain sufficient production by traditional methods from the available land area. At the same time the spread of information had led country dwellers to increase their demands and to want the benefits that they now know are enjoyed by many in the towns.

In thickly populated regions, many rural peoples have sacrificed their forests, since wood, at least in the short-run, is less indispensable than food. This has often led to erosion, where agricultural crops have been pushed on to unsuitable land. Temporary relief from food shortages has thus been bought by consuming the biological capital of trees and soil, leaving a smaller capital for future production of all kinds.

At the opposite extreme stand the sparse human communities of dense tropical forests. Their populations have in many cases declined because of

imported diseases; and their traditional methods of production by hunting and gathering or by shifting cultivation are constrained by the activities of neighbouring societies and by the shrinkage of the forest area. They inhabit regions of massive biological capital without benefiting fully from its product. New systems of forest management are needed if these communities are to develop.

Between these extremes there are many intermediate cases. Particularly important is that of the more arid lands which are given over mainly to grazing. Here the rural population has often remained relatively constant at a low level, but animal numbers have increased to satisfy the growing demand of neighbouring towns. Natural forests have been reduced to pitiful relics by a combination of grazing, fire and over–exploitation. The biological capital of soil and vegetation is maintained near its minimum level. The obvious solution, i.e. the reintroduction of woodland into such areas, is particularly difficult and depends mainly, if not entirely, on the community's willingness to restrict grazing.

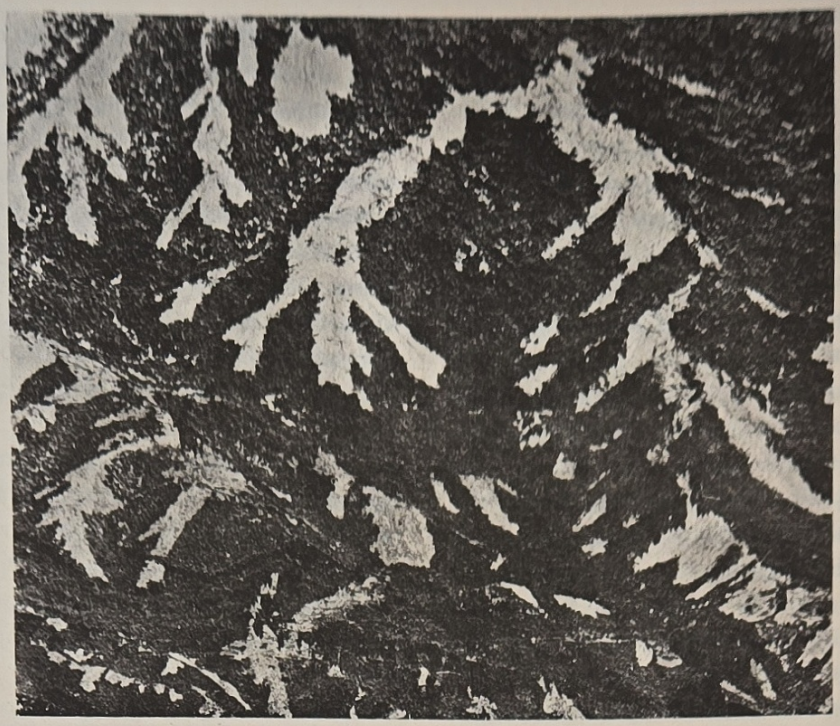
Rural dependence on forest outputs

The importance of forests and the goods and services from the forests to the rural peoples in developing countries is mainly threefold. Forest trees provide fuel and other goods essential to meeting needs at the rural household and community level. Forests and forest lands provide food and the potential for expanding the production of food. Forests in many situations maintain the environmental stability necessary for the continued functioning of the rural economy.

Wood is the dominant domestic fuel for rural people in developing countries, and for many of the urban poor as well. More than 1.5 billion people use wood daily for cooking their food and for maintaining essential levels of warmth in the home. Wood is the preferred fuel because it can be used without complex equipment, both for use and distribution, and can be acquired at little cost, often no more than the cost involved in gathering it. For the poor there is often no alternative to wood fuel or other locally-available organic materials. Commercial fuels, even where they are available, require cash outlays on stoves and related equipment which are generally beyond the reach of the rural poor. One consequence of growing rural populations is, thus, an inexorable growth in the pressures on locally-available forest resources and other sources of woody material. The source of wood fuel extends progressively from collecting dead wood to the lopping of live trees, the felling of trees, the total destruction of tree cover and eventually to the uprooting of stumps and removal of shrubs. Subsequent to this there is the diversion of agricultural residues and animal dung to fuel use. On lands subject to erosion, this inevitably contributes to a deteriorating environmental situation.

At the same time the steady disappearance of wood in the vicinity of the community means

Once there was a forest (IUCN).



Eroded land, Japan.

increased social hardship. Progressively, more of the time of household members must be devoted to gathering fuel. It has been estimated that fuelwood gathering now requires 360 man-days annually per household in the Gambia and 250-300 man-days in central Tanzania. As the situation deteriorates further, and the household is forced to purchase its wood fuel, a heavy burden is placed on the household budget. It is reported that up to 15 percent of household income is spent on fuel in the highlands of Korea, and up to 25 percent in the poorer parts of the Andean Sierra and the Sahelian zone.

Eventually, this shortage of wood fuel can affect the nutritional well-being of the people. In parts of West Africa, people have been reduced to one cooked meal a day. In the uplands of Nepal only vegetables which can be eaten raw are grown. In Haiti, a principal impediment to the introduction of new food crops with better nutritive value into the wood-poor hills is that they would require more cooking.

Fuelwood is not the only local need met from the forests. In many parts of the developing world, wood is the principal building material and local forests and trees are the source of building poles. In many areas trees are also a source of fodder. In Nepal, leaves make up about 40 percent of the annual feed of a buffalo, and about 25 percent for a cow. In dry forest areas, livestock often cannot survive without forest grazing. In the Sahel, leaf fodder is the principal source of feed in the dry season, and the excessive grazing of trees during the recent lengthy drought contributed significantly to the large-scale destruction of the vital tree cover.

Concurrent with these pressures on the forest to meet essential local needs are the pressures on forest land, which also arise from the need of expanding rural populations for more land on which to grow food. In most areas, forests are the largest remaining land bank – the one land cover which can absorb large scale further extension of the area under crop production. The existing area of forest in developing countries is being reduced annually by an estimated 5–10 million ha in Latin America, 2 million ha in Africa and 5 million ha in Asia. To the extent that this process releases to food production land which can *sustain* the growth of crops, this is logical and to be encouraged. But over large areas, the pressures of growing populations force landless farmers onto soils which cannot sustain crop production and onto slopes which cannot be safely cultivated – at least with the techniques and resources available to these farmers. The consequences of these practices in terms of wind and soil erosion, silting, flooding and drought, are well known. Some 10 percent of the world's population live in mountainous areas, but another 40 percent live in adjacent lowlands, so that fully half of mankind is directly affected by ravages of the watershed

environments.

It is reported that in India, 50 percent of the total land area is seriously affected by water and wind erosion. Indeed, displacement of fertile top soil is estimated to be around 6,000 million tons a year. In Pakistan erosion affects 76 percent of the total land area. Nepal is perhaps one of the most dramatic cases of its kind in Asia. In many parts of Nepal the forests have been cleared up to 2,000 m. Slopes of 100 percent are under cultivation. Huge landslides occur during periods of continuous rain. These landslides, which destroy lives and crops and remove the necessary humus, occur more and more frequently throughout the Nepalese hills, in part because ground-holding trees are disappearing fast. At present, the washing away of top soil is a threat to agricultural productivity in the remaining fields. Similar landscapes, perhaps to some extent less pronounced, can be found everywhere in the hilly areas in other parts of the world.

The erosion of agricultural soils often results in the siltation of rivers and water reservoirs. Thus, the river bed of the Nepalese Terai is rising between 15 to 30 cm a year. This rising of river beds, which occurs because of accelerated soil erosion and siltation, is a major cause of the more frequent and dangerous floods in all regions. But sedimentation also causes loss of reservoir water storage capacity. In the Indian Subcontinent the Mangla reservoir receives every year 100 million tons of sediment, of which the Jhelum river, due to indiscriminate felling and burning of the forest in the catchment area, contributes 81 percent. The Mangla reservoir was built to last 100 years or more. Sediment measurement after a few years of operation indicates that most of the reservoir's capacity will have gone in 50 to 75 years. These are illustrative of many similar examples.

In addition to providing land for settled agriculture, the forests are also increasingly used for temporary agriculture. There are now perhaps 200 million people practicing "slash and burn" farming (shifting agriculture) on perhaps 300 million ha of forest lands. In parts of South and Southeast Asia this form of land-use occupies some 30 percent of the officially designated forest area. Traditional systems of shifting agriculture, which employed a lengthy fallow period under forests to restore the fertility of soils which were capable of supporting agricultural crops for only a limited number of years, have largely broken down. Growing population pressures, and migration into the forest areas by landless people from elsewhere, have forced a progressive shortening of the fallow period to the

Habitat destruction, Nepal.

point where it suffices neither to restore soil fertility nor to recreate a useable forest crop.

Similar trends are discernible in the more open savannah woodlands of more arid areas. The problems of the gum arabic system of Sudan are largely a result of pressures to cultivate more land, at the expense of the fallow period under *Acacia*. The disasterous deterioration in the Sahel was basically largely the outcome of an increase in herd size to the point where the balance between grazing and vegetative cover was disrupted.

The preceding paragraphs have emphasised the negative effects of uncontrolled and unmanaged exploitation of forest and forest lands to meet community needs. Managed forestry can do more than check and reverse this situation. Forestry can make a major contribution to rural development if properly employed. If other alternatives for raising the incomes of the rural poor are not promising, the establishment of fuelwood lots may be the only way to assure them a supply of fuel and may provide a means to raise their incomes by diverting dung to use as fertilizer. There are also equity considerations involved. It might be easier to help the poor by providing them with fuel in the form of wood than with similar benefits provided through taxation and redistribution.

Systems of intercropping tree and other crops can both ensure stable practices on areas threatened by erosion and increase the productivity of land devoted primarily to wood production. In so doing, forestry can introduce important supplementary sources of employment and incomes. Forestry can even be the vehicle for substantially improving the physical and social infrastructure of the community.

In addition there are many other ways in which rural communities can draw upon the forests in one part of the world or another. Bush meat and honey provide supplementary food sources, as do a wide variety of tubers, fruits and leaves. Fish production in swamps or mangrove forests can also be an important protein source, for mangroves and swamp forests offer a most valuable protective and productive habitat for fish.

Forests and trees can produce cash crops, including such edible products as mushrooms, chestnuts, walnuts and pine kernels. Bamboo can be cultivated for shoot production, as is done in Japan. In many countries trees are grown at the smallholder level, to provide fuelwood for sale to the urban and semi-urban areas. In India the income from gathering and selling fuelwood is an important part of the economy of forest villagers, especially for the poor in these villages. Tree farming can also provide profitable industrial wood crops, such as the pulpwood grown by farmers in the Philippines.

Finally, forests provide timber and other raw material for local craftsmen and small-scale artisan activities. Throughout the developing world, doors and other builders woodwork, furniture, tools and other agricultural inputs such as fence posts are made locally within the community. Such products, together with wooden handicrafts, and such products of non-wood raw materials as "tasar" silk, can also be marketed outside the community.

MANGROVE WORKSHOP

The International Workshop on Mangrove and Estuarine Area Development for the Indo-Pacific Region was held in Manila, 14-19 November 1977. It was sponsored by the Philippine Government, IPFC, SEAFDEC, UNEP and UNESCO. Participants from 11 countries and representatives from international organizations presented country reports and specialist papers. The Workshop prepared proposals for research and development of mangroves and estuarine areas. The conclusions and recommendations of the Workshop stressed the importance of environmental management principles, the welfare of the people dependent on these resources, protection of endangered species and the need for research and development.

The Workshop also recommended the establishment of national multidisciplinary bodies to coordinate research and development in mangroves and estuarine areas. The need for international exchange of information was emphasized. The proceedings of the Workshop are expected to be published in January 1978 and will be obtainable from the Director, Bureau of Fisheries and Aquatic Resources, 860 Quezon Avenue, Quezon City, Philippines.

PUBLICATIONS

MAMMALS OF THAILAND

by Boonsong Lekagul and Jeffrey A. McNeely, 1977, Association for the Conservation of Wildlife, 4 Old Custom House Lane, Bangkok 5, 809 pages, 1450 illustrations, 275 maps, 8 color plates, 700 references, printed in a limited edition of 1000 copies, US$ 49.00.

With the publication of Mammals of Thailand a big gap has been filled in the presentation of knowledge of thai mammals. There were already numerous publications on Thai mammals produced by many authors and published in a variety of countries. All of these publications had in common that they covered only part of the aspects of Thai mammals. There certainly was a great need for a book covering all aspects, including taxonomy, distribution, external, dental and cranial characteristics, and general ecology and behavior. This was recognized by the Association for the Conservation of Wildlife, of which the senior author is Secretary General, and under which auspices the book has been printed.

As an introduction to the main work, there are fifty pages in which an explanation is given on taxonomy, description and adaptation, ecology and behaviour, distribution and numbers, zoogeography, and legislation. In the main work there is an introduction to all orders and families.

All species are illustrated, either by a photograph or a drawing, teeth and skulls are also illustrated. A short example for one species (Great roundleaf bat) is given below.

The book is a very comprehensive and valuable work. Unfortunately it is expensive for most people who are working on wildlife conservation or management. The Association for the Conservation of Wildlife (ACW) will give a 25% reduction to those who should have it but can not really afford it.

It is hoped that the ACW will follow up with a pocket-size, fully illustrated field guide to the mammals of Thailand. The knowledge is available, and since the ACW has already produced two field guides (Bird Guide of Thailand and Fieldguide to Butterflies of Thailand) both with Boonsong Lekagul as senior author and illustrator it could be done; and perhaps it should be done in the Thai language.

GREAT ROUNDLEAF BAT

Hipposideros armiger (Hodgson, 1835)

Synonyms: *Rhinolophus armiger* Hodgson, 1835; *Phyllorhina swinhoii* Peters, 1871.

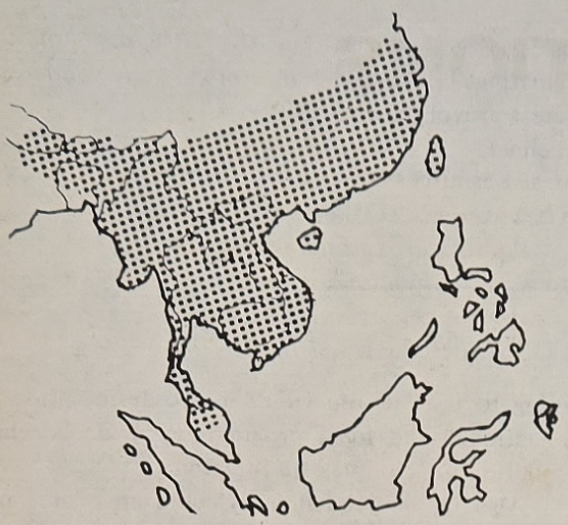
Diagnosis: Largest Thai *Hipposideros.*

Size: HB: 80-110; T: 48-70; FA: 88-98; E: 30-35 HF: 17-21.

Distribution: Southern China to Nepal, Assam, Burma, Indochina, Thailand, and Malaya; the subspecies *H.a. armiger* (Hodgson, 1835) occurs throughout the country.

Description: The fur is soft and thick, with two color phases: 1. hairs on back tipped with warm brown, followed by a broad zone of much lighter brown, and with a basal band nearly as dark as the tip; 2. darker, tips of hairs darker brown, with a broad subterminal zone dirty whitish, the base dark as the tip. The hairs of the mantle area are medium brown at the roots, pastel brown for the terminal two thirds. The ears and wings are dark brown. The tip of the tail is free from the interfemoral membrane. The anterior noseleaf is much wider than the posterior

Hipposideros armiger.



Range of *Hipposideros armiger*

leaf; there are four lateral supplementary leaflets on each side. The accessory transverse fleshy structures which arise behind the posterior leaf are small in females and young males, larger in old males. The skull has a prominent sagittal crest in old individuals. The first upper premolar is outside the toothrow.

Ecology and Behavior: These bats range from sea level to 1500 m., usually roosting in caves. They are early hunters, often coming out before dark, flying low around trees, with relatively rapid, steady flight. They typically keep the tail and interfemoral membrane turned up over the lower part of the back.

Detail of noseleaf.

ANIMALS OF ASIA

J. and K. MacKinnon - Animals of Asia, the ecology of the Oriental Region.
Peter Lowe, London, 1974, £ 3.95.

Whilst popular books on the wildlife of Africa could be said to be over-abundant, they are conspicuous by their absence in Asia. Published in 1974, "Animals of Asia" is a good book and worth mentioning for those of Tigerpaper's readers who would like to have an overview of different ecological zones of the region and its wildlife. It does not pretend to be a scientific treatise but it provides a lot of information through an easily readible text and abundance of beautiful photographs. Here is convincing evidence that the great variety of animals and their habitats is at least as interesting as that of the other continents. The authors who are well known for their work on the orang utan in Malaysia and Indonesia, have drawn on their own and others' personal experience in getting this message accross.

The book is divided in the following chapters, each of which could justify a book on their own:

1. Asia and the Oriental Region
   Prehistoric Asia. Wallacea and the boundaries of the Oriental Region.
   Climate and Vegetation.
2. The Tropical Rainforest
   The diversity of forest species. Stratification and niche separation. Life in the treetops. Forest gliders and bats. Life on the forest floor. Elephants, rhinoceros and tapirs. The carnivorous mammals. Forest birds.
   The forest at night.
3. The Fringe Habitats
   The riverine animals. Limestone caves. The sea coast, Mangrove swamps.
4. The Monsoon Forest and Savanna
   Predators and prey. Monkeys and squirrels. Birds of the waterholes.
5. The Desert Wastes
   Survival in the desert. The large mammals. Desert birds.
6. The Great Mountains
   The foothills. The bamboos and rhododendron forest. The alpine zone.
   High altitude invertebrates. Mount Kinabulu.

7. Man and the Changing Face of Asia

Man in Asia. Deforestation. Overgrazing. Introduced species. Overhunting. The changing scene. "The chances of conserving the natural fauna of tropical Asia depend entirely on the amount of widespread interest that these animals can arouse".

This passage appears on the first page of this fascinating book. We look forward to more such interest provoking books.

E. Pelinck
Forest Resources Division
FAO – Rome.

WORLD ACTION TO HALT DESERT SPREAD

An international co-operative programme to combat the spread of desert conditions and possibly reclaim some arid lands for productive use was launched by the two-week United Nations Conference on Desertification which took place in Nairobi, Kenya.

The Conference, ended on 9 September 1977, brought together the representatives of about 100 countries and many inter-governmental and non-governmental organizations to deal with the problem of "desertification".

Their concern was not the natural occurrence of deserts but those human activities which tend to create desert conditions on land that would otherwise be productive. An estimated 9.1 million square kilometres – an area almost the size of China – has succumbed to such activities.

The 1968-1973 drought in the Sahelian region of Africa focussed world attention on the problem, and in 1974 the United Nations General Assembly decided to convene the Nairobi Conference in order to give impetus to international action against the spread of deserts.

The Conference resulted in the adoption of a Plan of Action to Combat Desertification, an 89-page document containing 26 detailed recommendations for action at the national, regional and international levels.

The goal is to implement the Plan of Action by the year 2000, and the document contains recommendations for "immediate, initial actions". Implementation of the Plan, says the document, "is expected to be carried out by Governments through their national institutions, with the support, when requested, of international or bilateral programmes". It adds that individual countries may wish to select implementation measures appropriate to their needs.

With regard to the evaluation of desertification and improvement of land management, Governments that have not yet done so are urged to assess and evaluate desertification and the degradation processes leading to it. The aim would be to define priorities for national and local programmes in areas where population or resources are threatened.

Also recommended in affected areas are land-use planning and management based on ecologically sound principles which conform with social equity and which are geared to economic and social development.

Public participation, the Plan recommends, should be "an integral element of the prevention and combating of desertification", and "account must thus be taken of the needs, wisdom and aspirations of the people".

Corrective measures

As for corrective measures, the Plan calls for "efficient, economically and environmentally sound planning, development and management of water resources". Also called for are measures to improve the condition of degraded rangelands and to introduce suitable systems of rangeland and livestock and wildlife management.

Other recommended corrective measures concern: conservation and soil improvement; prevention or control of waterlogging, salinization and alkalinization in irrigated lands; improved irrigation and drainage systems; and improvement of the social and economic conditions of the people dependent on irrigation culture.

The Plan also suggests to Governments that existing vegetation be maintained and protected, and that special measures be taken for revegetation and its maintenance and protection, soil conservation, and the stabilization of moving sands. All necessary steps, according to another recommendation, should be taken to conserve flora and fauna in areas subject or likely to be subject to desertification.

Details of Action Plan

The Plan of Action, adopted by the Conference, begins with the statement that more than one third of the earth's land area is arid. The process of desertification, it says, has intensified in recent decades, and now threatens the future of 628 million people. Of this number, between 50 and 78 million

people are directly affected by decreases in productivity associated with desertification.

In the past half century, on the southern edge of the Sahara alone, as much as 650,000 square kilometres of once-productive land has become desert.

Drought represents a recurrent menace in various parts of the world, the Plan continues. "The Sahelian drought of 1968-1973 and its tragic effect on the peoples of that region drew world attention to the chronic problems of human survival and development on the desert margins."

The Plan defines desertification as "the diminution or destruction of the biological potential of the land", which "can lead ultimately to desert-like conditions".

Important factors

It goes on to note that important factors in contemporary society – the struggle for development, population growth and demographic change, the effort to increase food production, and modern unadapted technologies – interlock in a network of cause and effect. "Progress in development, planned population growth and improvements in all types of biological production and relevant technologies must therefore be integrated."

The Plan states that desertification is a self-accelerating process and, as it advances, rehabilitation costs rise exponentially.

"Action to combat desertification is required urgently before the costs of rehabilitation rise beyond practical possibility or before the opportunity to act is lost forever", the Plan adds.

It points out that in many cases technical solutions are available now, but that their application can be impeded by social, legal and sometimes institutional factors. In developing countries, the lack of financial resources constitutes one of the greatest obstacles to this application.

Socio-economic measures

A number of socio-economic measures are recommended in the Plan. One of them is for "economic and demographic policies that will support programmes for improving land use and sustaining the productivity of agro-ecosystems in drylands, including, as appropriate, maintenance of an adequate rural labour force, sedentarization of nomads and resettlement of those migrating from rural to urban areas".

Also recommended are programmes "to provide peoples affected by, or vulnerable to desertification with an adequate level of primary health care services, including family planning where necessary". As for human settlements in affected or vulnerable areas, the Plan recommends that they be located according to a national land-use plan that safeguards land with pastoral or agricultural potential by avoiding construction of permanent buildings.

With regard to drought, the Plan asks Governments to implement the recommendation on drought loss management adopted by the United Nations Water Conference, held last March at Mar del Plata, Argentina. Further, Governments should adopt preventive measures and protective strategies for effectively combating the risks and effects of drought, and adopt insurance schemes.

from UNITERRA *September 1977*

Overgrazing can create deserts (Vollmar/Gee).

Ceylon elephant *(Elephas maximus maximus)*.

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